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*Christianity and Science*  
*in the*  
*Twentieth Century*

BY THE REV.

A. E. BAKER

VICAR OF ST. MICHAEL-LE-BELFREY, YORK

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CHRISTIANITY AND SCIENCE IN THE  
TWENTIETH CENTURY

MY DUTY TOWARDS MY NEIGHBOUR.

*By the Rev. Francis Underhill, with a Foreword by His Grace the Lord Archbishop of York.*

THE PILGRIM'S WAY. *By the Rev. Desmond Morse-Boycott, with an Introduction by the Right Rev. Arthur Chandler, D.D., late Bishop of Bloemfontein.*

ETERNAL LIFE. *By the Rev. A. E. Baker, with a Foreword by His Grace the Lord Archbishop of York.*

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PRAYER. *By the Rev. W. E. Orchard, D.D.*

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THE REV. A. E. BAKER

Vicar of St. Michael-le-Belfrey, York

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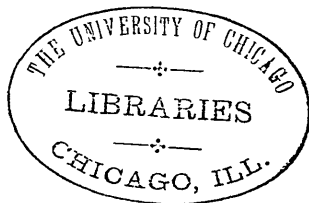
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*D. W.*

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## PREFACE

IT has long been a conviction of mine, a conviction which has been strengthened with the passing of the years, that very little is to be gained for the cause of religion or of ultimate truth by trying to eliminate from the teaching of the Church everything which presents any difficulty for, or contradiction to, the point of view of "modern thought." As Schweitzer has taught us, Christ came as a stranger to His own generation, and in every age historical Christianity has lived by creeds and standards which were not derived from the fashionable philosophy of the time, and could not be proved by it.

The concepts of the natural sciences are valid within the limits and for the purposes of those sciences, although a critical study of those concepts, and of the frequent changes they undergo, makes it improbable that they are adequate representations of ultimate reality. A consideration of human life and experiences, comprehensive enough to include the convictions which civilised mankind has valued most highly, and by which it has lived, shows that there are whole tracts of experience to which the methods of science do not apply and that its assumptions ignore. It is quite rational, however, to give religion and morality a place in life, and to make a consideration of their validity part of one's approach to reality. A primary assumption of this book is that

## PREFACE

religion and science are both necessary for an unpoverished life and a thought which shall not be narrowly sterile.

Some of the material here used has appeared in the *Pilgrim* and some in *Theology*. I have to thank the editors and publishers of those periodicals for their courteous permission to reproduce it. I also thank my friend Dr. McBride for reading the proofs and making some valuable suggestions.

A. E. B.

*Michaelmas Day, 1930.*

# Christianity and Science in the Twentieth Century

## I. MODERN DOUBT AND UNBELIEF

THE history of Europe is unintelligible without Christianity. When we have given all due weight to modern attempts to interpret history in terms of climate, or geography, or economics, Christianity remains firmly embedded in the structure of European culture and, therefore, of the European mind. It is not possible to tell the story of our civilisation without constant reference to the controlling influence of the Christian religion and the Christian Church on the course of events. Europe and the Faith were born together, for the Roman Empire was beginning to create a unified law and administration for the barbarian peoples of the West in the very years in which Jesus lived and died in Palestine. Christianity is sometimes represented as an alien intrusion from Asia, but Jerusalem was destroyed within a decade of the arrival of St. Paul in Rome, and the centre of the Christian religion has been in Europe ever since.

The Church was coming to self-consciousness and to power, in its organisation, its creed, its ideals of social and personal life, during the centuries of that Roman experiment which to moderns looks so solid and sure, but to the men who actually made it seemed a perilous adventure. And when the Empire decayed and fell, the Church, not easily or quickly, won its place in the leadership of the thought and life of Europe. It is a platitude that for five centuries the only light and order

in a great darkness were in the Church. *There* was gathered and preserved all that was salvable of the old civilisation, and the miracle is that so much, not that so little, was retained and handed on. And when the darkness begins to lift again, it is the Church which alone provides unity for Europe in life and thought and government. Feudal nobles, and dukes, and kings had not yet learned to think in terms of nationality, but they were accustomed to the thought of Christendom, which was Europe without Prussia! The universities, becoming real powers and drawing men from every land, were inspired and staffed by the Church. The only law which ran for more than a few hundred miles anywhere was the Canon Law, and men recognised it, and obeyed it, from Rome or Madrid to Aberdeen, and from Vienna to Dublin. Aquinas and Dante are the two glories of European thought; they are Christian through and through, and they prove, if anybody ever doubted it, that Catholicism, when it was unchallenged, meant not only religion but also a complete culture and civilisation. In those days, to be a good European and to be a Catholic were the same thing.

The causes of the break up of Catholic Europe in the Renaissance and the Reformation are many and complicated, and are not yet fully understood. The new navigators and their discoveries mark the beginnings of modern commerce, and this means capitalism and individualism. The revival of classical learning and the fall of Constantinople made a change in men's minds which cannot be easily estimated. But these things were probably as much results as causes of the fundamental upheaval that was taking place in the mind of Europe. It is not easy to exaggerate the part in that upheaval of the new cosmogony generally associated with the mind of Copernicus. Philosophy and theology (and

science as well, although writers sometimes omit to mention this) had been stated in geocentric terms, and this fitted the naïve common-sense view of the ordinary man. The revolutionary departure from the point of view of inherited common sense and of received philosophy meant an unheard-of challenge to tradition, and seemed, alike to churchmen, to scientists, and to the plain man, to be a denial of the teaching of the Church. It took time to learn to discriminate the kernel from the husk, the theological dogma from the view of the physical world with which it had been associated, and meanwhile men were familiarised with the idea that religion and science might be in conflict, and that a man might have to choose between orthodoxy and truth. And as the general tendency of the Renaissance was to exalt the natural and the human, and to find life's inspirations and sanctions in this present world, the new science made the physical and natural seem so vast as to fill all man's imagination, and the spiritual and supernatural became so far off as to seem unreal.

Copernicus published the first short statement of his scheme in 1530. It is a strange coincidence that it was at that time that the Reformation was beginning, Luther having been excommunicated nine years before. The great mediæval synthesis was shattered, and for good or ill the mind and spirit of Europe had broken from their moorings, and what we call the modern period had begun. It is difficult to resist the conviction that the Reformation was a tragedy. This is so, whoever was to blame for it. Men were quarrelling, soon nations were fighting, about religion. Rival teachers, warring Churches, pointed men to conflicting authorities. The era of private judgment had begun. And when men are too weak, or lazy, or timid to accept the responsibility of judging for themselves (and in a

divided Christendom even to become a Catholic is an exercise of private judgment) they take a despairing refuge in scepticism. The ages of faith were being succeeded by doubt and unbelief.

In England, strife and debate about religion reached their climax only in the second third of the seventeenth century. The religious anarchy of the Commonwealth led some thoughtful men, indeed, to a mysticism which is attractive because it is sincerely religious, but its most obvious fruits were rationalism and "common sense," and the beginnings of the modern assumption that the things about which Churches and sects quarrel are really of no importance. By the end of the seventeenth century the thought had sunk into the corporate mind of Western Europe that the Reformation break up was permanent. Catholic would not be able to conquer or convert Protestant, and Protestant would not be able to conquer or convert Catholic. As Mr. Chesterton has pointed out, two religions come to much less than one. "Many began to think that, as they could not both be true, they might both be false. When that thought had crossed the mind, the reign of rationalism had begun."

The direct effect of science on religion becomes obvious again during the eighteenth century, as a result of the almost idolatrous prestige of Sir Isaac Newton. Gravitation is as much the key word of the eighteenth century as evolution is that of the nineteenth. The best minds of the time turned to naturalism. Theology slipped into the background, and, as Dr. E. W. Watson puts it, the young theologians bought telescopes. The public attention was fixed on the stars, and human history, and Christianity as a historical religion, appeared not so much untrue as irrelevant.

It is well known that Newton was a very religious man, much interested in theology. Indeed, he was the

author not only of the *Principia* and the *Opticks* and other epoch-making scientific works, but also of a quaint *Observations on the Prophecies of Daniel and the Apocalypse of St. John*. Newton and his friends did their best to make it clear that they believed in a Divine Creator. "This most beautiful System of the Sun, Planets, and Comets, could only proceed from the counsel and domination of an intelligent and personal Being. He governs all things and knows all things that are or can be done. . . . Who, being in all Places, is more able by His Will to move the Bodies within His boundless uniform Sensorium, and thereby to form and reform the Parts of the Universe, than we are by our Will to move the Parts of our own Bodies." So far Newton. But, later, his account of the world in terms of rigid particles in mathematically computable motions was made the basis of a mechanical philosophy. Indeed, the popular materialism of the mid-Victorian times was really the Newtonian dynamics changed into a philosophy.

Mystery has no place in life, neither has miracle. The case for determinism is convincingly strong. Reason ought to be the basis of man's belief and behaviour; the attempt to base them on revelation has led to unsound arguments from Hebrew prophecy, and to accepting as the Word of God a Book which holds up as heroes and examples men of very imperfect morality. To take the miracle stories of the New Testament and of Church history as literally true marks a man as ridiculously poor in intelligence. These are the positions which the great English Deists of the eighteenth century—Collins, Tindal, Woolston, and Middleton—maintained, inspired largely by the Newtonian simplification of man's conceptions of the physical universe. It has long been believed, it has recently been proved, that Voltaire



and the anti-religious movement in eighteenth-century France owed much of their ammunition, directly, to the writings of the English Deists. In his day, Voltaire was the greatest figure in Europe. He had a passion for freedom and justice, and a love for his fellow-man. He was not without a sort of belief in God. "I shall always be convinced that a watch proves a watchmaker and that the universe proves a God," he wrote to M. M. Kahle; and on another occasion he said: "My reason tells me that God exists; but it also tells me that I cannot know what He is." But in his writings the Church and the Bible are always parodied or misrepresented. Catholicism is held up to obloquy and ridicule as an imposture and a fraud. In act as well as in word he scoffed at Christianity, and all that it holds sacred, in a way that no standard of morals or good taste could justify. He was anti-Christianity incarnate.

And yet it is even true of the English and French Deists that Christianity remains firmly embedded in the structure of their thought. Their "liberal" estimate of human nature is as opposed to Catholic thought as it is opposed to psychological realities, but it is safe to say that the theory that all men are equally wise and good, have the same capacity to rule, and only need education to remove all their imperfections, could not have appeared anywhere in the world apart from the Christian tradition. Christian, too, in this same sense, at least, that it cannot be conceived as having arisen apart from the Christian tradition, is the whole Romantic Revival in Western Europe in the last third of the eighteenth century, of which Rousseau was the forerunner and Goethe the full and typical expression. That movement was a renewal of the spirit of man, of his emotions and senses as well as his reason. It delighted in nature in a way which reminds us of the saying that

Solomon in all his glory was not arrayed like a wild flower. It had a passion for history, which explains why the nineteenth century had a historical sense to which the eighteenth never aspired. It saw the universe as an organic unity, to be realised by feeling, in the life of which development had a fundamental place. So the conception of evolution bulked large in men's minds, and the way was prepared, not only for Darwin's *Origin of Species* in 1858, but for Newman's *Essay on the Development of Christian Doctrine* in 1845.

But our subject in this chapter is modern doubt and unbelief. When Darwin's book was published, some clergymen, like Frederick Temple, gave it unbiassed and intelligent welcome, and some scientists, like Gosse and Owen, received it with unintelligent opposition. But, on the whole, the religious were shocked into condemning it, and the scientists took up its defence as if it had been a holy war, and carried the campaign into the enemy's country by attacking the dogmas of religion and the inspiration of the Bible. Gladstone and Huxley were bonny fighters whose wordy duels filled a large place in the monthly reviews of our grandfathers' day. The general atmosphere of the late seventies, in the English middle classes, was "honest doubt." Matthew Arnold's "Dover Beach" is typical, or Clough's "New Sinai," or Tennyson's chewing the cud of his pathos in "In Memoriam," or Browning's too strenuous determination to believe. The depression in the background which was causing all this threatening weather for the Christian faith was largely the shock which geology and biology had given to Biblical Protestantism.

Doubt and unbelief, however, were to become worse, were to affect religion in a more fundamental way, and were to spread into ever wider circles of the community. Science was the cause of this, but only indirectly, and in

a secondary sense. From 1870, which was the time when the Oxford Movement reached its highest point as a popular revival, the membership and attendance of the Christian societies in England have decreased steadily, but with increasing rapidity. During the second half of this period the movement has become a landslide. The cause of this most modern unbelief has not been mainly intellectual, but social. It has been the urbanisation of the West and the rationalisation of industry. (The latter process had been going on for a long time before the recognition of it was crystallised in a name.)

Rural life and agricultural work make it easy for a man to believe in God, and keep religion real and living by keeping it close to everyday experience. The dependence of the farmer on superhuman powers, on Nature and whatever Being controls Nature, is forced upon his attention every day. He ploughs and sows. If he be "up-to-date" he studies the nature of soils and the chemical composition of manures. He does his best. And very soon he can do no more, but must wait until "God giveth the increase." The sense of dependence, which is an integral part of the religious experience, is almost inescapable for the countryman. And it is equally true that in the rural community the duty to my neighbour, which is "like unto," of the same order of importance as, my duty to my God, is obvious and immediate, and only to be avoided "of malice aforethought." It is no accident that Christianity maintains its hold longest in the country, or to be explained by the natural conservatism of the countryman, or by his remoteness from books and new thought.

The townsman's life reminds him much less of God. His life is surrounded by, dependent on, social organisation. A strike affects his food and comfort much more

obviously than does bad weather or a poor harvest. Not Nature, but human nature, is the environment with which he has to deal. Electricity, chemistry, foreign trade, cold storage, these are the things which control for him the necessities of life. He comes to understand that whether he works and eats or is unemployed and goes without depends on a foreman's good temper, or an employer's incompetence, or a trade union leader's diplomacy, or the national tariff system, or the rate of exchange, or industrial conditions in another country or another continent, or war and peace. But it is Man, always, on whom his welfare depends, and there is no obvious point at which God must be taken into account and will not be denied. At the same time, rather paradoxically, as it may seem, his duty towards his neighbour becomes more difficult both to understand and to practise. A shareholder in a company has little share in the control of its behaviour, either towards its employes or its customers. A buyer can know little of the conditions under which what he buys is produced or distributed. The Christian obligations of an individual in modern urban society are a little remote and not easy to realise.

This anti-religious effect of contemporary civilisation becomes more intense as the industrial system becomes more completely mechanised. In a very real sense, machinery is the product of the scientific revolution. Without science it could not have been, and machinery made mass production possible. But machinery has mastered the spirit of man. What is euphemistically called "rationalisation" is the carrying of this process to its logically inevitable conclusion. It means that the man who had been subservient to the machine is now becoming superfluous. In every industry machines are displacing human beings to a tragic extent. In the twenty years

before 1925, machinery in the motor-car industry made it possible for three men to do the work of ten. A newly invented automatic machine for making electric light bulbs can produce as many articles as two thousand men. And alongside the machine the mechanisation of the worker (it is called "industrial psychology," "motion study," or "the scientific organisation of industry") means fewer men, though it may mean better conditions.

The whole development of industry and commerce means that the human, personal, element is being pushed into the background. The international organisation of trade means that employment in England depends on conditions of work and wages in the Far East. The control of industry by "finance" means that increasingly large numbers of great industrial concerns are in the hands of the board of controlling companies in London, who know nothing of the men who manufacture what is sold, or the processes, or the factories, who perhaps do not even know where the factories are. Modern industry is itself becoming automatic, beyond the guidance of any individual or group of individuals, with no human meaning. Its total imaginative effect is to make the men who are engaged in it feel like cogs in a machine. It makes God and the soul seem only words.

The social, and moral, and human effects of all this are extremely serious, although this is not the place to analyse them. Without religion, without worship, the spirit of man ceases to be sensitive to what gives life meaning and value. The task of religion, it has been said, is to assert and express personality in an apparently impersonal world. The chief part of the problem, then, at the present time is sociological. Humanity must, lest civilisation be destroyed, discover

how to control, and give meaning to, urban civilisation in general and industry in particular, so that they become means to spiritual ends, and not ends in themselves. This will be done in part through a new corporate affirmation of religion, and in part will lead to such a reaffirmation. A real factor, however, in the intellectual side of this task must be an examination of natural science, which is so important an element, not only in human life, but in modern culture and education, and a statement of the right relation between science and religion. The present book is a contribution to this, stated in untechnical language, so far as that is possible.

## BOOKS TO READ

*Does Civilisation Need Religion?* Reinhold Niebuhr. (Macmillan.)  
*Religion and the Modern World*, Randall. (Williams and Norgate.)

## II. WHAT IS SCIENCE?

**I**T has been said, with obvious rhetorical exaggeration, that man is the fiercest of all the beasts of prey. What is certainly true is that he is among the most helpless of the higher animals. He cannot compete in strength with buffalo or rhinoceros, in speed with deer or wolf, in ferocity or weapons of offence with tiger or ape. His bodily organs and instincts alike are uncertain and inferior. He has survived, however, and he will survive, in virtue of what is vaguely called his "intelligence." His superiority is now well established, but there must have been long ages when it was, as men say, "touch and go." Intelligence depends, for its survival value, on accurate knowledge and true understanding. And man was ignorant and, therefore, weak.

Below the level of civilisation man is ignorant, uncertain, helpless, and timid. His food supply is unreliable, because the domestication of animals and the cultivation of the soil have not yet been invented or discovered. Storm, frost, drought, famine, earthquake, and other natural phenomena, fill him with the awe of what can be neither foreseen nor controlled. The world is arbitrarily friendly or hostile. Man tries to understand the universe in order that he may conquer it, control it, and use it. That is how science begins, and why; it is inspired by practical needs, and vindicated by practical success. It is of scientific knowledge that the word of Francis Bacon is true, that knowledge is power.

The accumulated achievement of science, during thousands of years, is very impressive indeed. It began with things like speech, and fire, and tools, and weapons,

and clothing. Then came the shepherd, the farmer, the irrigator, all alike implying discovery and invention. The metals, bronze and then iron, writing, and glass follow. Gunpowder and printing are important. Telescopes widened creation in man's view; the proof, just two and a half centuries ago, that the sun is nearly a hundred million miles from the earth, must have been literally incredible for most people. Then came the invention of coke, the use of it in the manufacture of steel, the discovery of the possibility of large-scale steam-driven machinery—in other words, the Industrial Revolution. Railway trains, newspapers, telegraph and telephone, motor-cars, aeroplanes, and wireless, mean previously inconceivable possibilities of inter-communication, and produce very complex social and political conditions. The applications of electricity and modern developments in chemistry and medicine have made an enormous difference to the health and comfort of the human race. Man has gone a very long way in conquering, controlling, and using his natural environment.

Science is the knowledge which issues in this kind of control. What is the theoretical system implied and expressed in all this? In other words, what is the scientific view of the universe? Man begins by recognising certain particular sequences in the happenings in which he is placed. Night follows day, and day follows night. Always! It can be depended on. In many cases (there is some difference of opinion as to just how and why) man introduces the idea of cause into such sequences; the first event *necessitates* the second. A fire is followed by warmth, heat, pain, death. The fire, we say, caused the death. But we do not say that day causes night. Then man goes on to group these sequences together under certain resemblances, and so makes "natural laws." For example, when you double the pressure on



a gas, keeping the temperature constant, you halve the volume. That is known as Boyle's Law.

Every such natural law is a brief formula describing a great number of observations or experiments, and describing them in such a way as to help man to predict future events, and in part to control them. The phrase "natural law" is comparatively modern. The first use of it, recorded by the Oxford English Dictionary, was in 1665 by Boyle, the great English chemist. But it is a mistake to imagine, as modern writers commonly do, that the reality for which the phrase "natural law" stands was not known to ordinary people before the age of modern science. It is common to discredit the miracle stories, in the Bible and elsewhere, by assuming that the apostles, evangelists, and mediæval churchmen had no idea at all of the natural order of the world. But Herman Lotze pointed out long ago, in *Mikrokosmos*, that practical life is impossible anywhere, at any time, unless it can build upon the regularity and calculability of what happens, upon a necessary connection of things which can be known beforehand. The most common incidents of life inevitably taught men to know the operation of gravity; the modest attempt to build a shelter called up conceptions of the balances of masses, of the distribution of pressure, of the use of leverage. The earliest hunting, which used arrow and bow, had to calculate the propelling force of the taut string. It is quite certain that not only for St. Peter and St. Mark, and for the authors of the lives of the saints, but for savages, too, the world is largely a world of inanimate material objects governed by uniform law.

A natural law, then, is a summary description of how things have happened. For example, one law says that if a particle in motion strikes another particle, the movements of the two particles after collision are such that

the total momentum in any direction is unchanged by the collision. A law is not satisfactory unless we can say that it gives a summary description of how things have happened always. In the case of any actual collision, say that of two billiard balls, allowance would have to be made for modifying factors, such as the friction of the table, the resistance of the air, and the fact that the elasticity of the balls is not perfect. The law which gives an accurate description of actual collisions is, therefore, not a simple one, but it could be stated. But no natural law states, it cannot state, how things will happen. No human being has knowledge about the future. For all we know, the next time one billiard ball strikes another they may both turn into chickens. There is no recorded case in which this has happened in the past, but that is no logical reason for expecting that it will not happen in the future. But we do expect that what has happened will happen again. And usually we are right. Otherwise, nobody would ever play billiards, or do anything else. It is noteworthy, however, that the boasted power of science to foretell the future has no kind of logical explanation. It rests on the mere fact that we live in a world which is not a chaos, but fits our minds, and can be described by natural laws.

The discovering or inventing of natural laws, which describe, in brief summary, how things have happened, is not, of course, the whole aim of natural science. We need not only descriptions of the external world, but we need explanations also. The particular natural laws, then, are in many cases grouped together under a more general statement, called a scientific theory, which aims at "explaining" the particular laws dealing with the area of knowledge concerned. The line of demarcation between description and explanation is not always easy to draw in theory, but it is quite easy to illustrate in

practice. Kepler's first law is that the planets move in ellipses, and the sun is at one focus of the ellipse. Obviously, this is description, it is a summary account of a great number of observations of the positions of the planets relative to the position of the sun. If we ask *why* the planets move in this way we pass from description to explanation, from law to theory. And that is true, whether we say, with the Newtonians, that the sun attracts the earth towards itself, although it is ninety-three million miles away from it, or, with Einstein and the relativists, that the presence of matter causes the curvature of natural paths in a space-time continuum, or that God wills that the earth should move in this way. None of these are matters of direct observation, nor can they be. By no device can we *see* the sun attracting the earth or curving the natural paths any more than we can see God willing the earth to move round the sun. Each is a theory put forward to explain observed events, or those collections of observed events which we call laws.

Why do scientists accept one theory rather than another? The answer is, of course, that one theory seems a more satisfactory explanation than the other. By this we may mean that the theory accounts for more laws, and more facts, than its rivals. That is, perhaps, why relativity is driving the Newtonian theory out of the field, but it would not explain why scientists prefer Einstein's explanation to the more ultimate one that planets move as they do because God wills that they should do so. A second reason why a theory seems more satisfactory is that, sometimes with slight modifications, it enables scientists to foretell facts which have not been observed hitherto, or to suggest laws which have not yet been formulated. The observance of such facts, or the proving of such laws, obviously provides a very

plausible confirmation of the theory. Now, the theory that planets move as they do because God wills that they should could hardly suggest any hitherto unobserved facts or unformulated laws; that is one reason why it has no place in science.

This statement that scientists accept a theory because it seems more satisfactory may seem not only so vague as to be useless, but also to imply that the universe is of such a kind that it corresponds to our minds, so that what seems to us unsatisfactory is, by that fact, almost proved to be untrue. This seems the crudest kind of anthropomorphism to some people, when it is pointed out explicitly, but there is no doubt that it is a necessary part of the structure of science. As long ago as the fourteenth century, for example, William of Occam enunciated the principle which has ever since been known as Occam's razor, *Entia non sunt multiplicanda præter necessitatem*, entities must not be multiplied unnecessarily. This means that of two possible explanations of any event we must always, other things being equal, choose the simpler. This is sound, as a principle of method; but it is one of the reasons why science is abstract, and possibly untrue; because, for all we know, the reality in any particular case may be complicated, and not simple.

This prejudice in favour of simplicity, in contrast with what is complicated, is perhaps the explanation of Descartes' famous criterion of truth, that it must be "clear" and "distinct." However that may be, it is significant that Descartes marks the beginning of what is characteristic of modern science, the consistent attempt to apply mathematics to the phenomena of Nature. To banish from science such obscure conceptions as "affinity" and "substantial form," and phrases like "Nature abhors a vacuum," and to put in their place

exact measurements of length, or mass, or time, to do away with "final causes" or "purposes," and to be content with "causes," was Descartes' aim. It marks the revolution which is the beginning of modern science. In principle, it is quite plain and straightforward. We will make everything as clear and distinct as possible. That is to say, the typical science is mathematics. In other words, the business of science is exact measurement, its instruments, characteristically, are the yard measure, the balance, and the stop-watch. Our aim will be achieved when the universe and all that is in it have been interpreted as machines.

The scientific ideal of description is exact measurement, a description in terms of number. It means that matter and energy can be controlled and used, that experiments, and the conditions of them, can be repeated, and that more and more of experience can be expressed in mathematical terms. Certainly, although often unconsciously, it means that we are dealing only with physical realities, and are leaving what is mental or spiritual out of account. We are concerned with quantity—for quantities are measurable in exact terms, and qualities are not. And so far as we continue to believe that we are covering all that exists by our measurements we are, quite inevitably, constructing a world-view which is a thorough-going materialism.

The typical theory of modern science is a mechanical theory. If we can think of anything as a machine—the universe, a living organism, a gas, an atom—we are satisfied. The Newtonian cosmogony was mechanical, much of the progress in modern physiology is due to the working hypothesis that the constituent parts of the human body are related as the parts of a machine are related, and when we have formed a mental picture of a molecule as a *system* of atoms united by forces, or of

an atom as a system of electrons and protons in motion, we are satisfied. In other words, our ideal is to explain everything by applying mathematics to it. "Give me space and motion," said Descartes, "and I will make the world." We have tried to do it.

The ultimate ambition of natural science is sometimes stated to be to find at last one single, simple, general statement which would include and imply within itself every discoverable physical law, and by the help of which all natural phenomena could be explained and predicted. There is a well-known passage in Laplace's essay on Probability which states this view. Having declared it to be an axiom that "a thing cannot begin to be without a cause to produce it," and having summarily disposed of the notion of "freewill" as an easily explained illusion, Laplace proceeds: "We ought then to regard the present state of the universe as the effect of its antecedent state and as the cause of the state that is to follow. An Intelligence, who for a given instant should be acquainted with the forces by which Nature is animated and with the several positions of the beings composing it, if, further, his intellect were vast enough to submit these data to analysis, would include in one and the same formula the movements of the largest bodies in the universe and those of the lightest atom. Nothing would be uncertain for him; the future as well as the past would be present to his eyes." (Quoted by Dr. Ward, *Naturalism and Agnosticism*, vol. i, p. 41.) The last sentence is the important one: "The future as well as the past would be present to his eyes." It is a commonplace of theology that God is omniscient. But this infinite intelligence is not Divine; it can only know matter and the manifestations of matter, it can see the connection of cause and effect; and it has sufficient analytical powers to express these things in a huge

differential equation. It can know the thoughts and desires of the heart only because it can watch the changes in the grey matter of the brain. It is a Calculating Demon, not a God. The future would be present to it, only as the future position of a log of wood floating on the ocean could be accurately calculated by a man who knew the direction and strength of the currents. But such knowledge of currents could give no clue to the future position of a boat with a man at the helm; it might or might not drift straight with the current. But Laplace and later orthodox science deny that the will of God or man can interfere with the chain of cause and effect. That this is the sense in which the statement of Laplace has been understood and approved can be seen from a passage of Du Bois Reymond's Leipzig Address, which was delivered in 1871. "As the astronomer has only to assign to the time in the lunar equations a certain negative value to determine whether, as Pericles embarked for Epidaurus, there was a solar eclipse visible at the Piræus, so the spirit imagined by Laplace could tell us by due discussion of his world-formula who the Man in the Iron Mask was or how the *President* came to be wrecked. As the astronomer foretells the day on which—years after—a comet shall re-emerge in the vault of heaven from the depths of cosmic space, so that spirit would read in his equations the day when the Greek cross shall glance again from the mosque of St. Sophia or England have burnt her last bit of coal. . . . To such a spirit even the hairs of our head would be numbered, and without his knowledge not a sparrow would fall to the ground." (Quoted by Dr. Ward, *op. cit.*, vol. i., p. 42.)

This means, of course, that the universe is an absolutely closed system, a whole in which every part is exactly determined and fixed, with nothing contingent,

no freedom of choice, no possibility that any event, natural or human, could have been any the least bit different from what it has actually been. The physical universe is an infinite machine, grinding along its inevitable, predetermined way. The end is implied in the beginning, as is every link in the chain that joins one to the other. Every event is the result of definite causes, and from those causes no other event could have resulted. The amount of energy in the universe is constant. It follows, therefore, that all that happens can be explained, nay, must be explained, without any reference to the influence of mind, or spirit, or angel, or God. As W. K. Clifford put it, "the universe is made up of atoms and ether; there is no room for ghosts."

It is arguable that this mechanical view of the universe altogether excludes the idea of a Creator. In the arrogant words of the Preface to the late Ernst Haeckel's *Riddle of the Universe*, "Science has conducted God to its frontiers, thanking Him for His provisional services." The universe has evolved itself from chaos into order, and it appears self-sufficient. It is true that an order seems to imply an ordering mind, at least to the ordinary man, but the scientist can imagine chance variations producing adaptations, and a continual chain of such adaptations, all produced by chance, resulting in such a universe of law as exists at present. Among a million pebbles on a beach there may be one, by chance, perfectly spherical; and with extraordinary good fortune we may happen to pick it up. Among a million possible universes that might have resulted from the original chaos it is possible that one might be, by chance, completely ordered and rational. It is just pure luck that that one possibility, and no other, should have been realised. It is singularly fortunate that the universe is a cosmos, not a chaos! There is, as a matter of fact,



only one universe, which is a universe of law and order. Law and order are naturally associated with mind. The odds are infinity to one that the only universe which exists should both be completely rational and should also have come into existence without any control by a mind or will.

Logically, then, it would be too much to say that mechanistic determinism is inevitably atheistic. There may be people who find it possible to reconcile it with faith in God, and even with Christianity. But it certainly reduces man to the level of things, crushes his individuality, and makes him of very little importance in the universe. Thinkers who really try to imagine the universe held together in time and space by these iron chains of cause and effect either give up all belief in human freedom or, like Kant, go to fantastic lengths of far-fetched paradox in order to conceive a human will which is really free, although on the level of phenomena its manifestations take an ordinary place in the sequence of cause and effect. In a world governed by the "uniformity of nature" and "the conservation of energy," freedom seems at best a perilous speculation. And where human freedom is doubtful, and human individuality minimised, the belief in God is not likely to persist.

The mechanistic view of the universe is that it is a machine which makes nothing, and has made nothing, except itself. It has no constructor, and serves no purpose. More than one recent writer has insisted, however, that the more elaborate a machine is the more certainly we ask what it was made to do. The obvious fact about a machine is that it implies an engineer. It is only when we forget the mechanic that we can conceive a mechanism as anything else than a system which serves the purpose of a mind and will. "The machine loudly proclaims its designer," says Dr. F. E. England in his recent

book, *Kant's Conception of God*: "There has been a deliberate arrangement with a view to the accomplishment of an end." This means that the vast mechanism which is the world is all guided by Divine purpose. Here is the machine, producing inevitably the predetermined result, but that result, we may recognise when the time comes, is good—beauty, and truth, and love, and joy. Can we not say, then, that God is the meaning of it all? May not the scientist say, "The laws of Nature are the thoughts of God," and see, in the vast universe in which law is never broken, the revelation of an infinite Wisdom which has foreseen every eventuality, and made provision for it, so that there is never any necessity for Him to interfere with the ordinary working of cause and effect, but that without any intervention "All things work together for good to them that love God"? I do not think so. It is doubtful whether a thorough-going belief in the uniformity of Nature can consistently be held along with a belief in a conscious Divine purpose. More than that, the uniformity of Nature, so conceived, makes it difficult to give any meaning to the thought of God's freedom. He is imprisoned within His own laws. They come between Him and us. We cannot know Him directly, at best we can only infer that He exists. And when one man says that all this law implies at least a directing mind, another will say that, on the contrary, everything goes so well by itself that we have no need of the hypothesis of God. In any case, the God whose existence can be reconciled with the uniformity of Nature is a God who does everything, but who does not do anything in particular. To point to any event in your life and say, "God did this," "Here God helped me," is either to deny the uniformity of Nature or to use words which are only a pious metaphor.

It is interesting to note that Newman perceived this quite clearly more than two generations ago.

"If, then, by the word (God) you do but mean a Being who keeps the world in order, who acts in it, but only in the way of general Providence, who acts towards us, but only through what are called laws of Nature, who is more certain not to act at all than to act independently of those laws, who is known and approached indeed, but only through the medium of those laws; such a God is not difficult for anyone to conceive, not difficult for anyone to endure. If, I say, as you would revolutionise society, so you would revolutionise heaven, if you have changed the Divine sovereignty into a sort of constitutional monarchy, in which the throne has honour and ceremonial enough, but cannot issue the most ordinary command except through legal forms and precedents, and with the counter-signature of a minister, then belief in God is no more than acknowledgment of existing sensible powers and phenomena, which none but an idiot can deny. If the Supreme Being is powerful or skilful, but just so far as the telescope shows power, and the microscope shows skill, if His moral law is to be ascertained simply by the physical processes of the animal frame, or His will gathered from the immediate issues of human affairs, if His Essence is just as high, and deep, and broad, and long as the universe, and no more; if this be the fact . . . then is He but coincident with the laws of the universe." (Newman, *Idea of a University*, Discourse II.)

Before we can estimate the relation of modern science to religion, however, and in particular the effect which it has on man's conception of God, we must study, at least in outline, the description of the universe which is actually given by the sciences, and of man's place in it. The next two chapters will be given to this. Then we

must devote a chapter to the account of religion itself given by the modern psychologies (for they are many!). Then the questions must be asked, and answered, What is the validity of science? What are its limitations? Is there any truth outside it? And when we have given some kind of answer to these questions we shall be in a position to consider the truth of religion and how it is related to the truth of science.

## BOOKS TO READ

*What is Science?* Dr. Norman Campbell. (Methuen.)  
*Naturalism and Agnosticism*, James Ward. (Cambridge University Press.)

### III. THE STORY OF THE UNIVERSE

**I**T is not easy to imagine what the earth was like just before life first appeared on it. There were no trees, of course, and no grass. The earthworms had not begun to play their part in crumbling up the soil. There was no chalk, no limestone or marble, and no coal. What made up the land-masses were the mountains of igneous rocks, such as granite, and the layers of sediment, sand, clays, shales, and so on, which have been produced through the destruction of the igneous rocks by the forces of the weather, air, water, frost, and lightning.

Because life in its primitive forms was probably not adapted to resist direct sunlight, we assume that the earth, just before life began, was enveloped in clouds. This means that the atmosphere contained not only much water vapour, but also a good deal of dust, on which the water was condensed which formed the clouds. The temperature of the oceans had cooled down to about  $145^{\circ}$  F., for no life can maintain itself above that temperature. The earth is gradually radiating more energy into space than it receives from the sun. But the discovery of radio-active elements, which liberate energy as their atoms become more simple, suggests that the actual cooling of the earth has gone on much more slowly than nineteenth-century scientists believed. It used to be a difficulty for evolutionists that there did not seem to have been sufficient time for evolution to have taken place. We know now that the energy which the earth is radiating into space is not all derived from a decrease in temperature. The time which has elapsed since the earth was just cool enough for life to be possible is there-

fore much greater than used to be thought. It is probably about 300 million years.

It is probable that all the planets and their satellites were once part of the sun. The generally accepted theory is that between 1,500 and 8,000 million years ago a large star passed close to the sun and drew out a streamer of gas towards itself. This gaseous matter cooled with comparative rapidity, condensed into liquid near its ends, and broke up to form the planets. At first the sun was very far from the centre of the orbits of the planets, and when they passed near it, its attraction caused the formation of moons. The moon is almost as old as the earth.

The moon was, originally, much nearer to the earth than it is at present, and at that time the earth rotated much more rapidly than it does now. The day lasted between three and five hours, and the month was very little longer than the day. The moon, being so near to the earth, produced great tides. Those acted as a "brake" on the earth. In order to maintain equilibrium, the moon's distance from the earth steadily increased. The friction of the tides is still reducing the rotation of the earth, but hardly to an appreciable extent. The day is getting longer. Each century, measured in days, is just under a second shorter than its predecessor. At the first the earth had a diameter of about 5,500 miles. As a result of its drawing other matter into itself (meteorites, for example), it grew until its diameter was about 8,100 miles. Since then it has been cooling, and consolidating internally, and its present diameter is about 7,900 miles.

Modern mathematics make it possible to formulate very probable theories as to the history of the universe. The primeval chaos, we can now assume, consisted of a highly rarefied gas diffused evenly through space, at

an almost incredibly low density of about  $10^{-80}$  that of water. When and where a disturbance occurred to cause a condensation of matter at any point in space, the mass so formed would tend to increase under the influence of gravity, both in extent and in intensity. So giant nebulae would be formed, each weighing as much as millions of stars. A nebula entirely free from rotation would be a perfect sphere. They all rotate more or less, so all assume a more or less lens-like shape. Increased rotation means the ejection of matter in the equatorial plane of the nebula to form groups of stars. It is so, by the break up of nebulae, that the stars are born.

Usually a star as it cools under a high angular velocity breaks into two stars, which continue to rotate round each other. The sun, it appears, never had an angular velocity sufficiently great to produce such a "binary system"; its history has been different, as we have already seen. The enormous amount of energy radiated by the sun is supplied only to a negligible extent by the contraction of the sun's volume due to gravity, but almost entirely by the dissociation of the atoms of which it is composed. The sun's heat is supplied from sub-atomic energy, in part resulting in the transmutation of elements of high atomic weight into those lower in the table, but chiefly the result of the actual destruction of mass. The main substance of the sun is being destroyed, with an enormous liberation of energy. Sir J. H. Jeans has calculated that the sun is losing mass at the rate of almost four tons per second, and it is said that the destruction of a drop of oil would mean sufficient energy to drive a liner across the Atlantic. At the same time, of course, the sun is in all probability gaining mass by picking up diffused matter as it passes through space. The present rate of reduction of the sun's mass is about 1 per cent. in 150,000 million years, and it has been radiating energy

at approximately its present rate since the beginning of the first Ice Age, nearly a million years ago. The sun, like other stars, is steadily but very slowly decreasing in brightness and in mass.

This means that the life-history of a star must be enormously longer than had been estimated. Sir J. H. Jeans has calculated that the stars are from 5 to 10 million million years old, and the sun is between 7 and 8 million million years old. Many of the stars in the Galaxy or sidereal system to which the sun belongs are much younger than this, but the majority of them are of approximately the same age. The Galaxy, or Milky Way, is less than 10 million million years old, and the whole physical creation dates from about 200 million million years at the outside. It is, perhaps, necessary to emphasise two points about these speculations. First, that they are speculations. They are guesses based upon observed facts; the mathematics used seem to be without mistakes; the results obtained do not contradict more observed facts than any other theory of the universe; but, when all is said, they are guesses which must be accepted with caution. Secondly, the statements of time only claim to be probably of "the right order of magnitude." When a scientist says "10 million million years," he means, "I think it is nearer to that than to 1 million million years or to 100 million million years." The universe is not infinite in time. Two hundred million million years is a long time, measured by human standards, but the difference between it and infinite time is itself infinite. Chronology, however, has certainly changed since Ussher suggested 4004 B.C. for the Creation.

What is the world made of? Or, as the old song puts it, "Oh, dear, what can the matter be?" The spectro-scope has made it quite certain that the sun and its



planets and the stars are made up of the same substances as compose the earth—hydrogen, iron, sodium, and so on. In 1868 an element was discovered in the sun (hence it was named “helium”) hitherto unknown on the earth. Later, its spectrum was observed in the light from many stars. It was not until 1895, however, that helium was discovered on the earth. Such facts as these have made scientists quite certain that the universe is all made of the same stuff. We know what the stars are made of, and the old nursery rhyme has had to be re-written :

“ Twinkle, twinkle, little star,  
Now we all know what you are;  
Flames of soda, streaks of tin,  
Sulphuretted hydrogen.”

Until about a generation and a half ago it was believed by the generality of chemists that all known material substances, organic and inorganic, were made up of atoms of about ninety elements, which could not be further dissociated into any more simple substances, although it had, of course, been suggested that all the alleged elements were really made up of one element—for example, hydrogen. During the last forty years, however, an army of investigators—Crookes, Röntgen, the Curies, Sir J. J. Thomson, Rutherford, and a host of others, among whom English-speaking workers hold an honourable place—made it probable, by work on radium and on “rays” of different kinds, that we ought to think of all the elements as made up of atoms (which are, of course, submicroscopic in size), each of which is a system of particles in motion, comparable to the solar system. The dimensions of the nucleus of the atom are, it was thought, very small compared to those of the atom itself. In the atoms whose weights are about the middle of the table, for example, the diameter of the atom would be

about sixteen thousand times that of the nucleus. This nucleus contains both *positively and negatively charged electric charges*, but the positive charges predominate. Surrounding this nucleus, in rapid motion and more or less stable equilibrium, are a number of electrons—probably negative charges of electricity—that number being equal to the resultant positive charges in the nucleus. Matter, then, as analysed by the chemist and physicist, with the help of the powerful tools which modern mathematics puts into their hands, seems to be made up of charges of negative electricity in rapid motion (electrons), and the nuclei, which are made up of electrons and fundamental units, protons, all alike and positively charged. Professor Andrade has put it vividly: "An atom is empty space which has peculiar properties because of the presence of a few specks of electricity." It all sounds strangely different from the solid tables and chairs, and the variegated beauty of flowers and birds, which are the material world to which we are accustomed.

The physical universe, as natural science describes it, is, indeed, predominantly empty space. Sir J. H. Jeans has given a vivid illustration of this. If we had Waterloo Station and only six specks of dust in it, that would represent the extent to which the universe is "crowded" with stars. In the solar system empty space predominates overwhelmingly. So it does in an atom. If there were six wasps flying round in Waterloo Station, that would represent the extent to which a carbon atom is "crowded" with electrons; all the rest is empty space. "We live in a gossamer universe," says Sir J. H. Jeans; "pattern, plan, and design are there in abundance, but solid substance is rare." But however far we get from hard "matter," and however near we get to "energy" or "electrical charges" in "emptiness," we must not make the mistake of thinking that the natural scientist,

with his balance, and rule, and stop-watch, and galvanometer, can ever lead us across the time that separates the material from the mental or spiritual. There is much loose thinking and writing on this point. Natural science, so long as it keeps to its own sphere, can never so much as touch the question whether the "cause" or "explanation" of the universe is or is not spiritual. It begins with matter and energy in space and time, and there can be no more in the conclusion than there was in the premises.

Already, however, the account which we have given of the atom is out of date. During the last few years experimental phenomena have been observed which cannot be explained on the assumption that an atom is a system of negative electrons moving in orbits round a positive nucleus; that mental model has broken down; it has proved itself, as a fiction, inadequate to explain the facts. The attempt to provide a mental model of an atom which will explain the phenomena of modern physics leads us to think of an electron of such a character that it occupies the whole of its orbit at once. Or we can say that it is impossible to define both the position and the velocity of an electron. One writer says that it is probably as meaningless to discuss how much room an electron takes up as it is to discuss how much room a fear, or an anxiety, or an uncertainty takes up. Another writer says that if you ask what an electron is, the most up-to-date answer is that it is an unknown source of radiation or a disembodied wave system! Certainly the difficulty of explaining modern theoretical physics makes the popularisers of twentieth-century science (your Eddingtons, and your Jeanses, and your Dampier Whethams) write like mystics and poets. It seems that we have arrived at the limit of what can be told, if not at the limit of what can be thought. We

cannot say what an atom is like; we can only find an equation which will describe the conditions under which energy is absorbed and radiated by it.

We have indicated the prevalent theories as to the constitution of matter and as to the development of the universe. We have shown that there is reason to believe that the universe, at least as we know it at present, is not infinite in time, but is the result of a great "outburst of creative activity" at a definite period in the far distant past. There is also, and this is the next point to be considered, reason to believe that the universe is not infinite in space. There is a finite, not an infinite number of heavenly bodies, such as stars, suns, planets, moons, and comets. For if the stars were distributed fairly regularly, and there were an infinite number of them, the whole heaven would shine with a bright light, because a star would be in every direction somewhere, at a greater or smaller distance from the observer. Light, then, would seem to fill the whole sky, unless it be weakened or absorbed in cosmic space. There are good grounds, however, for asserting that light is not absorbed in space, and it follows that the universe of stars is a gigantic, but finite, accumulation which either suddenly ceases or gradually becomes very thin.

The universe is inconceivably vast in space. Recent calculations by Dr. Harlow Shapley and other American workers suggest that the Milky Way is a huge flattened disc containing between 30,000 and 100,000 million stars. It takes light about a quarter of a million years to travel from one end of this disc to the other. This means that if the furthest star in the Milky Way had been destroyed before the first man appeared on the earth (through a collision with another star, for example) we should not have discovered the fact yet. There is also evidence of the existence of stellar systems, outside that to which

the sun belongs, which are so far away that it has taken light more than 100 million years (moving at 186,000 miles per second) to reach us from them. Modern astronomy gives a new thrilling intensity of meaning to the words of the psalm, "When I consider the heavens, the work of thy fingers, the moon and the stars, which thou hast ordained, what is man, that thou art mindful of him? and the son of man, that thou visitest him?"

The universe, nevertheless, is not infinite, neither is it in infinite space. At first sight this seems like a paradox. How can space be finite? We cannot conceive the end of space. We could never arrive at a spot in empty space where it would not be possible to go further. Mathematical physics, however, has put forward the conception of a space that is finite, but not bounded, because it is curved. The meaning of a curvature of three-dimensional space can be stated in mathematical equations, but it cannot be described in sensible images, it cannot be imagined. We look at a sheet of writing-paper, we see a plain surface, possessing two dimensions. We look at the surface of a sphere, a tennis ball, for example, and we understand what is meant by the curvature of a two-dimensional surface in a three-dimensional space. By analogy we can perhaps conceive, although we certainly cannot picture, the meaning of the curvature of three-dimensional space in whatever number of dimensions it may have and need to twist about in. Euclid's geometry, for instance, does not apply to the surface of a sphere. In that surface, if we define a straight line as the shortest distance (on the surface) between two points, then two straight lines can enclose a space, and if we take the poles of the sphere as our two points, any number of straight lines can be drawn between them. On the sphere, a straight line cannot

go on for ever, because it will return to its starting-point. The surface of a sphere is obviously finite, but it is unbounded.

The geometry of the physical space in which we live may not be Euclid's geometry. Einstein holds that our space is curved. It is unbounded, but it is finite. Light, moving along a "shortest possible line," would, after an inconceivably long time, return to its starting-point. This has not, of course, been tested directly, but there are facts of observation which support Einstein's view. It has been calculated that the radius of space is 84,000 million light years, and that the journey round space would take a ray of light 500,000 million years. It is suggested that two faint nebulae (L 3433 and M 83) may actually be the backs, seen the long way through space, the fronts of which may actually be our two nearest neighbours in the sky (M 33 and M 31). We are reminded of the words of William Blake in *The Creation*—

"The starry heavens reach no further, but here bend and set  
On all sides."

The curvature of space, according to Einstein's theory, is produced by the presence of matter. Indeed, the definition of matter, according to Einstein's cosmology, may well be "a region of the universe where natural paths are curved." This hints at a new sort of picture of gravity. If we had a highly polished floor, which was curved so that the centre was very slightly lower than the corners, but so little that nobody walking across the floor would notice it, and if we put a billiard ball in the centre and one at each corner, then the balls at the corners would roll towards the centre *as if they had been attracted* by the ball there. We might explain as due to a mysterious pull (mysterious because it means action

at a distance) what was really due to the curvature of a surface. Similarly, Einstein's theory of gravity is that such motions as those of the planets round the sun are not caused by the "pull" of the sun, but are due to the fact that the smaller bodies move in the shortest possible paths through a part of space which has been disturbed by the presence of the huge mass of the sun. But, if this be the case, we shall expect that not only material particles, but also the electro-magnetic vibrations which make up a "ray" of light, will be deflected from their straight path when they pass near a large mass like the sun. This had never been suspected, still less observed, until Einstein prophesied that it must occur. The exact deflection of light required by his theory, however, was observed in the solar eclipse of 1919, a striking confirmation of the very abstruse mathematical speculations which he had published.

This "curved" space, however, according to the modern physico-philosophical description of nature, is really an abstraction from a four-dimensional continuum. Long before Einstein's theory was published, Mr. H. G. Wells had pointed out, in *The Time Machine*, that a thing that does not last for any time at all cannot be said to have a real existence. "Any real body must have extension in four directions: it must have Length, Breadth, Thickness, and Duration. . . . There are really four dimensions, three which we call the three planes of Space, and a fourth, Time. . . . There is no difference between Time and any of the three dimensions of Space, except that our consciousness moves along it." Before and after are no more fundamental than before and behind, above and below, right and left. Minkowski, one of the most brilliant of modern mathematicians, has declared, "Henceforth space by itself, and time by itself, are doomed to fade away into mere

shadows, and only a kind of union of the two will possess an independent reality."

It is obvious, when once our attention has been drawn to it, that we use space to measure time (the distance on the face of a clock, for example); we even speak of a "space of time." It is equally true that we need time to measure space, time to go from one point to another, or at least to look from one point to another. The physical universe, then, is a four-dimensional continuum.

Two results of this doctrine are important for our purposes. First, it seems certain that how this continuum is divided up between time and the three dimensions of space depends upon the observer; it is "relative" to his purposes and his movements. Space is relative. If the whole universe were compressed to the size of an orange, and everything in it, including our body and its organs and our standards of measurements, become correspondingly smaller, we should not know that any change had taken place. It is only a rather vulgar lack of imagination that has bludgeoned the mind of the modern man into talking of this vast universe; it would be quite as true, and for some purposes much more convenient, to speak of this comfortable little universe. Einstein has proved that if a rod has a definite length for an observer with respect to whom it is at rest, then it will appear shortened to an observer who is in motion, relative to the first observer, in the direction of the rod's length.

"Space is thought's and the wonders thereof, and the secret of space;  
Is thought not more than the thunders and lightnings? Shall  
thought give place?"

SWINBURNE.

Similarly, time is relative. Its measurement, obviously, depends on our standards of measurement. If everything suddenly began to go a thousand times more



slowly than at present—the movements of the constellations, the rotation of the earth, the swing of the pendulum, the beat of our hearts—nobody would know that there had been any change. Einstein has proved that to an observer in motion with reference to a series of events they appear to happen more slowly. And although most people think they know quite well what they mean when they say that two events happen at the same time, it has been shown that the notion is obscure and riddled with contradictions, and that two events which are simultaneous for an observer at rest with reference to them are not simultaneous for one in motion. And if space is relative, and time, it is a simple matter to show that motion and direction are relative, and we are in a position to believe that Einstein's theory may be true. The popular statement of that theory is that all motion is relative; "it is of necessity impossible to determine absolute motion by any experiment whatever." In more exact and technical language, Einstein's general theory of relativity is that "there are an infinite number of systems of reference moving with respect to each other, in which all physical laws assume their simplest form."

If Einstein proves to be right, and there is no such thing as absolute motion, then all motions whatever are relative. This applies to rotations as well as to motions in straight lines or in curves, for the theory holds that inertia and gravitation are the same. An old dispute comes up, therefore, for retrial. It appears that Galileo and his judges were both right. It is all a matter of convenience whether we say that the earth rotates about its axis once in twenty-four hours, or that all bodies rotate about the earth once in twenty-four hours. Whichever of these statements be true, the observed facts are the same. So that many of the confident and sarcastic things

that historians of science have said about the conservatism of the Roman Church will have to be rewritten.

Another result from the doctrine that space and time are abstractions from a four-dimensional continuum is that four measurements are necessary to define the relation between any two events. Each of these may not be the same for all observers, if all have not the same relations to the events, but a certain combination of these four measurements is constant for all observers, whatever their spaces and times may be. In other words, it is convenient to speak of events as the primary realities, and of space and time as qualities. A simple psychological analysis shows that our perception of matter is really an inference or construction built up from our perception of events, and Dr. A. N. Whitehead has built up a philosophy of the physical universe on the assumption that what we call substance or reality is only the path of a series of events. Space, time, and matter, then, are each, in themselves, abstractions, the result of the mind's analysis of experience. Events in a four-dimensional space-time continuum are, for the physical science which is based on relativity, the reality of what we call the external world.

#### BOOKS TO READ

*The Universe Around Us*, Sir J. H. Jeans. (Cambridge University Press.)

*On the Nature of the Physical World*, Sir A. S. Eddington. (Cambridge University Press.)

#### IV. LIFE AND EVOLUTION

WE have seen the stage, vast in space, upon which, after an unimaginably long time, life appeared. Of the origin of life upon the earth science can tell us nothing, partly because there is no evidence that living organisms arise, or have ever arisen, from non-living matter, but more generally because science is always baffled by anything so unique as a beginning.<sup>1</sup> It was suggested by Kelvin that the simplest forms of life arrived on this planet on meteors or dust, having travelled through cosmic space from some other planet. But such supposition, even if it be possible, would only remove the problem of the origin of life a stage further back, and there is no evidence that life exists anywhere else in the universe but on this planet.

The mathematics of probability make us quite certain that the conditions which led to the formation of the sun's planetary system (see pp. 27, 28 above) are so extremely rare as to be practically unique. One in every 100 million million stars has planets attached to it, and a new planetary system comes into being once in a thousand million years. The conditions of temperature and atmosphere, and the other chemical and physical conditions which make life possible, form a minute fraction of the whole range of conditions which exist in the universe as a whole. It is certain, contrary to the speculations of Giordano Bruno and of many thinkers since his day, that planets on which life exists are very rare, and we have no reason to think that it exists in any planet but

<sup>1</sup> It is said to be conceivable that globules of colloids required the power of extracting energy from light, and that living organisms resulted; but attempts to obtain experimental confirmation of this have been failures.

ours. For all we know, life, physical and mental, may be a unique phenomenon in the physical universe, peculiar to the earth.

The physical universe came into being through 200 million million years, and then life appeared on one tiny speck of a planet in one corner of it. To one man this will make it almost certain that life is an "accident." It might so easily have not been at all, seeing that it only occurred in one place. It seems absurd to argue that the universe, practically infinite in time and space, came into being in order that life might appear at one point in it. To another man, on the contrary, the very uniqueness and peculiarity of life make teleology more probable. If, everywhere, matter had come to be accompanied by, and used by, life, it would seem as if the latter were the natural and inevitable result of the former. As it is, there seems greater place and opportunity, as there seems greater need, for purpose and choice.

As natural science can give no description of the beginning of life on this planet, so it cannot describe or explain what life is in itself. The most it can attempt is a general description of what living organisms do. A living creature is distinguished from a machine by certain characteristics which together make up its "behaviour." It is not simply pushed or pulled by forces acting on it from without, it can move spontaneously, and it can persist in such spontaneous movements after the immediate external occasion for them has ceased to operate. Its movements are not predictable in detail, it can vary them "at will," and its movements come to an end as soon as they have achieved the situation at which they aim; for the thorough-going determinist has to admit that everything goes on in the organic world as if living things strive actively towards ends. It also seems to be the case that an animal learns from experience, and

that its behaviour becomes more efficient as a result. A living creature has an active power of self-maintenance as against its environment; it has a relative permanence of form, but takes nourishment, grows, and reproduces itself; its activity is complex, and apparently purposive. In practice, we call an object "living" if its activity more or less closely resembles our own; we assume that it has an "individuality" like our own.

Much of the most fruitful work in biology has been the result of the assumption that there is no "vital force" or similar entity characteristic of, and peculiar to, the world of life, and that we can explain all the phenomena of living matter by means of no other categories than those with which chemistry and physics describe the inorganic world. Scientists have been satisfied that the changes in form and structure, in composition, colour, size, and shape, of living matter were due to chemical changes, and the action of physical forces, which may be more complicated than, but are of the same type as, those which take place in non-living matter. The late J. Loeb argued that the apparent "behaviour" of some of the lower animals, their reaction to light, for example, was the direct result of chemical changes in the living matter of their bodies caused by the light, and he hoped to be able to demonstrate that the instinctive (and ultimately all the apparently purposive) behaviour of the higher animals and man could be explained as the product of such "tropisms," as they are called. This is still a field of controversy, but the majority of biologists and psychologists seem to be coming to the conclusion that only the very simplest movements of living creatures can be explained as tropisms.

The chemical and physical changes which take place in a living organism have certain peculiarities which

differentiate them from inorganic changes. A steam-engine and the body of a warm-blooded animal may both be looked upon as devices for the transformation of energy. A steam-engine is fed with coal. The oxidisation of the coal ("burning," it is usually called) sets free its potential chemical energy in the form of heat. This heat produces an expansion of the steam in the high-pressure cylinder, which forces forward the piston. As a result of this wheels turn round, and work is done. The potential energy of the coal is turned into mechanical work. But in the process a great deal of the energy is wasted by radiation from the various parts of the machine and by friction. Only a very small proportion of the energy of the coal is available for useful work. In the case of the warm-blooded animal, however, the differences are as important as the resemblances. The oxidisation of its food produces the energy required to maintain its bodily heat and the mechanical work used in bodily movements and the motion of the heart, lungs, and blood. But the chemical changes take place without the loss of anything like the same amount of heat, proportionately, as in the case of the steam-engine. The machine can only change potential energy into mechanical work by changing it first into heat, and much is lost in the process. The animal changes energy directly into work, and loses or wastes very little.

The transformations of energy in a steam-engine are, in general, irreversible; they result in a diminution of available energy. But in the economy of life changes take place in the opposite direction. In the green leaves of plants, for example, the energy of sunlight, which is ordinarily wasted, is used to transform carbon dioxide and water, substances of relatively low potential energy, into starch, and indirectly into sugar and proteins, all of which are of much higher potential energy. This is

used for the supply of energy necessary for animal life, and also, in wood and coal, for heat required for the practical purposes of human life. Although it is true, therefore, that life is not a "force" or energy, and does not bring any additional or different kinds of energy into play, processes certainly take place in living matter which cannot be paralleled in the absence of life.

The inadequacy of physics and chemistry to describe the phenomena of life can be made even more plain. Any action of a living body, as, for example, a man lifting his arm, can, theoretically, be described from either of two points of view. It can be described in mechanical terms as the result of a very complicated series of stresses and strains, due to the interaction of muscles, bones, and so on. If we go further, and ask how these forces originate, we are involved in the chemistry of the living cells. The further we go, the more complicated—impossibly complicated, one may say—does the description become, so that it is very difficult to give a complete account of the simplest living action in such terms. On the other hand, from the biological point of view (as for the consciousness of the active agent himself), the action is a simple unity, and all that is required for complete description of it is to relate it to the general purposes and activities of the whole organism.

All that is most characteristic of living behaviour, in other words, is lost in the process of analysis, which is all that physics and chemistry can offer by way of description. It is, indeed, not too much to say that many of the concepts which are most important in modern biology, such as adaptation, harmony of action, development, heredity, evolution, have no meaning if our description of life is restricted to the chemico-physical level.

It is also true, and not unimportant, that many of the observed facts of the behaviour of living organisms imply a freedom of initiative which is literally inexplicable in terms of physics or chemistry. It has been shown that the blood of any animal will not tolerate the injection into it of putrid matter from the body of another animal, but at once produces the appropriate substance to dissolve and destroy it. If the lenses of rabbits' eyes be ground up and injected into the blood of fowls (what an experiment!) the blood produces a serum capable of dissolving rabbits' lenses. The proof of this is that, if some of this serum is injected into the blood of a rabbit, the young born from that rabbit have weak eyes. The phenomena of *restitution* also defy mechanistic or physico-chemical explanation. For example, if a newt's leg be cut off it will grow a new one, and that not once or twice. Such facts imply function and purpose, and the unified life of the organism which can only be described in such terms.

The importance of this discussion is surely obvious. If physics and chemistry are adequate for the description of life and its phenomena, we are inevitably shut up to materialism and determinism, and not only religion, but all the other spiritual values of man's life are futile dreams. A functional biology, however, if it be proved necessary, means the kind of relativity which makes each science autonomous within its own sphere, and allows the contribution of each, from mathematics to history and ethics, to hold its own place in the complete statement of truth. But a biology which recognises what physics and chemistry cannot describe also implies the reality of consciousness, and its effect on the living organism, in the higher forms of life, and probably in some rudimentary form in the lowest. That mind has direct and real influence on outward events is an axiom of



“common-sense” thinking. But this raises very serious difficulties for a scientific thinker. Every physical event has a physical cause; that is one of the assumptions of all science. And the amount of energy in any perfectly isolated material system is constant; that is another assumption of scientists. The human body is a material system. And it seems certain that the mind cannot produce any effect in the brain or, through the brain, in the rest of the body, without a breach in the principle of the conservation of energy. That is where we come to a really disputed point. Mr. Julian Huxley declares that the principle of the conservation of energy holds for living organisms as well as for non-living matter. Professor J. Arthur Thomson emphasises the fact that no exception to the principle of the conservation of energy has ever been proved; and, on the other side, Professor J. B. Pratt argues, with much force, that the experimental tests to decide the question would have to be exceedingly delicate—that the quantities of energy concerned are probably very small, and that it is, antecedently, quite probable that such intervention of mind in the world of matter could never be absolutely proved or disproved by any instruments the physicists could devise. So that we are in this position. All men in their sober moments are convinced that by an act of will they can produce effects in the external world of Nature. I will to move my hand, and, as a result, my hand moves! Science cannot describe how it happens; between the act of will and the movement of the hand there is, in our knowledge, an absolute discontinuity. But the fact is there. And that indubitable fact makes two elements of the Christian faith not unreasonable. The miracles of Jesus are described in the Gospels with what Professor Otto calls “such an assured and plain simplicity,” with a clarity so wellnigh disconcerting, that they cannot be

the fabrications of legend. If any human will can produce material effects, have we any right to put any limit to what could be accomplished by His will, absolutely at one with the will of the Father? And if the spirit of man can so play a part in the world of Nature, interfering in its ordered scheme, suspending its universal laws, then it is not absurd to believe that the will of God can take the initiative, and in the work of grace perform particular acts of freedom in His own world. But unless we can continue to affirm the real effect of man's mind in the world of Nature, through his outward actions, we shall find it very difficult to provide any philosophical justification for any theism worthy of the name, not to speak of the Incarnation and the miracles and Sacraments, which are of the very texture of transcendental Catholicism.

Any modern study of life necessitates a study of the doctrine of evolution. All modern biology is evolutionary biology.

Evolution postulates the fundamental unity of all life. The present state of things in the animal and vegetable "kingdoms" is assumed to be the result of a state that was not quite so complex; this in its turn was derived from a condition yet more simple, and so on until, theoretically, we arrive at the original ancestors of all living creatures, simple, single-celled organisms. That is the theory of organic evolution.

Similarly, the evolution of the universe means that all things have developed from an "undifferentiated homogeneity" to an increasingly "differentiated heterogeneity." Astronomical cosmology tries to show how that may have happened, but Sir J. H. Jeans has pointed out that all that we know of the chemical history of atoms suggests that the development of the ninety-two chemical elements has been, not from the relatively

simple to the relatively complex, but in the opposite direction. He believes that the formula describing cosmic evolution will be opposite to that describing organic evolution. He puts it very pungently: "Biological evolution moves like a sailor who runs up the rigging of a sinking ship."

Evolution was suggested as a possibility by more than one Greek thinker of pre-Christian times, and is a natural element in the world-view of Goethe and Hegel and other products of the Romantic Movement. The contribution of Charles Darwin, at the end of the fifties of last century, was to provide this fascinating ancient speculation with a sure foundation in observed fact. By his theory of natural selection he provided a description of a possible *method* of evolution. He backed this up by an almost incredibly large amount of observation in the spheres of many different sciences (embryology, botany, zoology, comparative psychology, and geology), and illustrated the way it works by a most attractive variety of examples.

"The struggle for existence" and "the survival of the fittest" are, of course, merely synonyms for "natural selection." The theory is that each individual organism is born with certain deviations from the average stock. Those which give him an advantage over his fellows, in the struggle to live in the particular environment in which he finds himself, will lead to his survival in preference to those who do not possess those advantages. He, and not they, will tend to leave descendants. These descendants will probably inherit their parents' advantages, for the variations with which a creature is born it tends to transmit to its descendants. Of these, again, some will be born with variations which give them an advantage in their particular environment. Nature acts as a kind of sieve, by which advantageous

variations tend to be preserved and accumulated, and the weaker or disadvantageous are eliminated. So the wonderful variety of life has arisen. There is no doubt, however, that at first sight this theory seems to make any assumption of purpose, whether conscious or unconscious, in the universe an unnecessary luxury. What appeared to an earlier generation to be examples of a wonderful adaptation of an organism to its environment seem to the Darwinian to be the result of a ruthless destruction of all the other "chance" variations which did not happen to fit the environment.

But the Darwinian threat to Christian theology was more serious even than this would imply. If man, with his conscience and reason and hunger for the Eternal, has been produced by "natural selection" (spread over millions of years, and with no single trace of purpose in it) from an infinitesimal blob of protoplasm, is it not probable that it is only conceit (useful in the struggle for life, of course!) which makes us think that there is more value and meaning in the end of the process than in the beginning? Does not the "survival of the fittest" mean that Nature is on the side of the strong and opposed to the weak? To live according to Nature, which in every century since the beginning of European thought has been the counsel of the philosopher, is seen at last to mean backing up the strong because it is strong, and treading on the weak because it is weak. Success is the only ethical standard. And if the great instrument of all progress is the struggle for life, then not only does the universe put the seal of its approval on violence and selfishness, but we are compelled to assume that whatever God there is is expressed in this great law of existence. It does not seem easy to reconcile with this naturalistic interpretation of things the belief that God is Love and that Love is the Law of His Kingdom.

These developments of Darwinism gain much of their plausibility, however, from confusion of thought and, in particular, from a too literal use of highly metaphorical phrases. "The survival of the fittest," for example, has, for biology, no trace of any ethical or qualitative content. What survives may be better or worse, more beautiful or more ugly, more lovable or more hateful, than what is eliminated. Such considerations are not covered by the phrase at all. It means this, and nothing more than this, that in any particular environment that will tend to survive which, in that environment, is fittest to survive, or that which is best adjusted to that environment. The "fittest" to survive in the University of Oxford will probably not be the "fittest" to survive in a village of Papua. Similarly, "the struggle for life" is a phrase which has been given a more positive meaning than it ought to bear. It means no more than that, as the earth is not infinitely large and infinitely productive, those organisms will survive and propagate themselves which are quicker to accommodate themselves to, and to appropriate and use, their environment. At the lowest levels of life it is a single cell which is the subject of selection. At a higher stage, a multicellular body, acting as a unity, survives or is eliminated, and this means that variations in cells or tissues or organs, if they are not directly disadvantageous, get a chance to survive, although they may not be immediately useful, and later may form part of a more important variation which proves of advantage at a higher stage of development. At a higher stage still, not the individual, but the herd or group becomes the unit upon which natural selection plays, and a wonderful variety of individuals becomes possible within the group, giving rise to differentiation of function and, at times, allowing developments to take place which are of no "survival value" to the individual, but are of great

advantage to the community. "The struggle for life," then, ceases to be primarily a selfish thing; while the lower levels develop, and depend on, the instincts of self-preservation, the higher levels demand and develop the parental instinct, and the herd instinct, or group mind. Altruism is natural because it is instinctive. It is as natural, though not so primitive, as selfishness. And one must remember that moral qualities—justice and mercy, and pity and love—are the products of evolution, at least as certainly as is selfishness. It marks the beginning of the process, they are produced at the end. They show the meaning of the whole, therefore, more adequately than the more primitive feeling can do.

Natural selection, as a description of the method of organic evolution, is entirely negative. It aims at showing the way in which certain "variations" are eliminated and others are preserved. Darwin was compelled to accept the fact of variation without any further explanation or description of it, for "chance," of course, is never, for the scientist, any more than a name for ignorance. The successors of Darwin have tried to tackle the problem, with some measure of success in throwing light on the question, but there is a good deal of "encircling gloom."

Whatever be the cause of a new species, it is clear that the power of variation, and not natural selection, is the positive element in evolution. That the latter is, apparently, merely mechanical does not prove that the former may not be teleological. In any case it is worthy of note that a recent writer on evolution, Professor Arthur Dendy, makes the considered statement that, while man selects for his own purposes and modifies organisms to suit his own ends, Nature selects to the benefit of the species operated upon. If we consider the evolutionary process as a whole, observing ever more perfect adjustments to an ever-widening and richer en-

vironment, the onus of proof is on those who deny, not on those who assert, that the valuable and intelligible products of evolution demand a teleological interpretation of the whole process.

How far does "evolution" really satisfy the need of the human mind to understand how and why things are what they are? Is the complex, the heterogeneous, really "explained" when we see the chain which connects it with the simple, the homogeneous? Does anything really "new" appear in the process of evolution, or is all that is present in the later stages of the process merely a rearrangement of what can be found in the earlier stages? If we decide for the former alternative, how can the earlier stages satisfy us as an explanation of the later stages? Where does the "new" come from? What is the "new," and what does it mean? These are the very questions which we want answered, and these are the very things for which the earlier stages of the process offer no explanation. But if we prefer to believe that there is nothing new or original "evolved," that the meaning and value of the last stage is to be found in the beginning, that all that happens is rearrangement, then words like "progress" or "evolution" are merely snares for the unwary, they describe nothing real. What is, has been, and that is all there is to say about it.

A recent attempt to avoid this dilemma is summed up in the word "emergent," coined by Professor Lloyd Morgan. He admits, or rather emphasises, the reality of progress. He recognises the appearance of something really new and unpredictable at more than one stage of the evolutionary process. He accepts these novelties, when they appear, "with natural piety." He points out that all the activities of a living organism can be explained as physico-chemical processes, without assuming any different or new forces to be acting, and yet that in

a living organism the way in which these chemical and physical events run their course is different from what it would be if life were not present. Similarly, when an animal becomes "conscious," the biological processes are not transformed; they achieve the same results by the same methods as before. And yet the behaviour of a conscious organism is different from what it would be if consciousness were not present. And similar things can be said about conscience when, at a later stage, it appears. These new gains or gifts in the process of evolution are a new direction, a new quality, a new relation, uniting, lifting on to a new level, giving new meaning to, what was present before. There is a new creation, quite impossible to predict until it has appeared. What emerges is dependent on what existed before, and raises that previous existence to a higher level, and gives it richer meaning. There is continuity in the progress, and progress in the continuity.

This, of course, is all very attractive, and as science, as a "description," is helpful, and emphasises important points which are in danger of being overlooked. But as philosophy, as an "explanation," it is hopeless. Professor Alexander's phrase, "with natural piety," and Professor Lloyd Morgan's word "emergent" are just ways of confessing our ignorance. On this view, we don't know the origin or cause of life, of consciousness, or conscience, and we bow our heads in reverent agnosticism, "with natural piety," and comfort ourselves with the word "emergent." The emergence of living out of non-living, of conscious out of what was unconscious, of what is self-conscious out of what was not conscious of self, of what can recognise the moral law out of what is not free—these are a proof that mathematical determinism cannot describe evolution (evolution and mechanism are, indeed, contradictory concepts), but



only purpose, freedom, teleology. A growth is explained by its later stages, not by its earlier, as a tree is known by its fruits, not by its roots. The meaning of a process of development has no logical connection with its origin.

The view that man's mind, as well as his body, has evolved is gaining ever wider acceptance among psychologists, and experiments on animals give clues for the understanding of human psychology. In particular, modern views about instinct in man and its relation to intelligence have been much influenced by the study of animal behaviour. As we pass up the scale of (bodily) evolution we seem to pass from the less highly developed mind to the more highly developed; and yet we are faced with the extraordinary gap between the mind of the lowest man and that of his nearest animal neighbours or kinsfolk. We try to recognise, and to emphasise, similarities. Dogs laugh, we think. We try to persuade ourselves that they have a glimmering of a conscience. And yet, though we give our hearts to them, we are forced to recognise that *all that is most important in what we mean by mind* is the possession of man alone and is alien from the brutes. Reason is human. The sense of beauty is human. (There seems no support for the old idea that the peacock's tail or the nightingale's song has been developed by "sexual selection" and therefore imply artistic appreciation in "the female of the species.") No animal models in clay or paints in water-colours, or appreciates our attempts to do so.

If we find fragments of fossil skeletons, a piece of a thigh, or a jawbone, we may argue as to whether they belonged to a man-like ape or an ape-like man; but if we discover a crude statuette or a wall-painting, we know that it is human workmanship. We have crossed the boundary between animal and man. Similarly, moral

values are human, and so is religion. If we find a skeleton which has been buried, we know that a human being buried it. Man is the only animal that makes graves, for he alone believes in immortality. The more one studies comparative anatomy, the more one is impressed by the resemblance between the brain of a man and those of animals; the more one studies comparative psychology the more one is impressed by the differences between the mind of man and those of animals.

Some success has attended the attempts to show how man's sense of right and wrong has been developed through the activities of the parental instinct and the herd instinct, but it is safe to say that the identification of conscience with instinct only seems plausible if we either assume the original existence of what we are trying to explain, or else empty the word "conscience" of all that is most characteristic in its meaning. If justice be explained as the result of a social and cultural development which began with expediency, it still remains true that justice is not expediency, but justice, laying an absolute yoke upon the conscience which its humble predecessor could never claim. All attempts to explain the higher in terms of the lower are doomed to fail in the same way. Either the lower is assumed to be as high as the higher to begin with, or the higher is treated as no higher than the lower in the end.

It is, indeed, difficult to apply the concept of evolution to mental or moral or spiritual things. The only spiritual differences that have any significance are differences of quality. Physical changes, in theory at least, can be measured quantitatively, and to them "evolution" may apply. In the spiritual sphere there is considerable ground for the suspicion that a word like "evolution" is just a cover for the inconceivable and the miraculous.

It is only by a somewhat far-fetched analogy, and metaphorically, that we can speak of the evolution of things like civilisation or the idea of God, or apply a concept like the "survival of the fittest" or "natural selection" to competing philosophies or mythologies. The proportion of speculation to known fact is still so great in the realm of sociology that any application of the idea of evolution must be very uncertain. It is arguable, indeed, that evolution by natural selection implies concepts which are of very little use in the description of man's progress, and the development of his civilisation, once he has appeared on the earth. For natural selection means that the species is changed by the action of its environment, but it is characteristic of man that he changes his environment in order to bring it into harmony with himself.

Evolution can never be the final explanation of things. Because science is based on classification, it is helpless in face of anything so unique as a beginning. The evolutionist philosophy seeks to find the explanation of things in an ever more complete simplicity. To use Herbert Spencer's vocabulary, it views the universe as a passage from "homogeneity" to "heterogeneity." But complete homogeneity is indistinguishable from nothing. Time and space alike would be inconceivable in it. Where all is sameness, change cannot begin. To explain the beginning of evolution we must assume heterogeneity as well as homogeneity—that is, we must assume that evolution has already begun. Evolution, therefore, is an idea that can only be applied to a universe in being; it cannot show how the universe began to be.

It is baffled, similarly, before any other beginning. The origin of life on the earth is an inexplicable mystery. Thorough-going evolutionists like Tyndal have tried to get over the difficulty by assuming that in all matter,

even in what we call inorganic, there is the potentiality of life. Which is either another way of saying that at a certain point life appears, or else it warns us off from the mystery with a meaningless word. Similarly, the beginning of mind is indescribable. A psychologist like Professor William McDougall almost seems to argue that wherever there is life there is mind, while others banish mind from a large tract of the animal world. Similarly, we have argued already that the human values—morality, art, religion—mark an absolute break. They show that the human mind is different in kind, rather than in degree, from the animal. All these points mark positions which are impregnable to any evolutionist philosophy. They are there, and it is no use pretending that they are not.

A generation ago it began to be fashionable to accept evolution, but to emphasise the gaps in the evidence and in the argument, and to claim that these implied the direct intervention of God, and so saved the belief in religion and the supernatural. Evolutionists could not explain the origin of life, or the beginning of mind, or where conscience came from, or the sense of God. So we laid the foundations of the temple of faith on the gaps in our knowledge. Every new discovery, every new theory, filled the believer with trepidation. He trembled for the Ark of God. There was grave danger lest the interests of science and the interests of religion should become directly opposed. It is realised now that the safe line is the line of courage. On the one hand, science must confine itself to description, to showing the "how" of the great process of Nature, without failing to recognise the gaps that still remain to be filled in the account that it gives; and, on the other hand, every part of the whole process must require, for its explanation, the creative omnipotence of eternal spirit. If any single

happening can be explained, ultimately, without God, then the whole can be explained without Him.

The relation of evolution to the doctrine of creation, which is an essential part of theism, is purely contingent. Creation is a dogma, the product of revelation rather than of reasoning. It is difficult to understand, and not easy to believe; but, like others of the more mysterious things in the Christian creed, though itself be dark, it throws a flood of light on other things. It involves the ultimate mysteries of the relation of the infinite to the finite, the relation of eternity to time, the relation of spirit to matter. But, without it, religion either disappears or maintains a precarious existence as the pantheism which sees God everywhere (and, therefore, nowhere?), but can never be quite certain who He is. For if God be the All, He has no character. Creation does at least mean that God and the universe are not identical. Philosophy, on the other hand, must choose between the difficult conception that God created the universe out of nothing and the more difficult conception that the universe evolved itself out of nothing. For the view which is sometimes suggested, that the physical universe never had a beginning, reduces the whole conception of evolution to nothing.

Creation, of course, is the supreme miracle. It means that God "intervenes," or, at least, that He has intervened. It is a unique event, for if it happened at all it only happened once; the concept of an eternal creation proves meaningless when it is analysed, a contradiction in terms. Before the spectacle of creation, as before any unique happening, science can but stand amazed. If she cannot classify, she can do nothing, and not even an Irishman can classify the unique.

The attempt to explain mind and conscience and man's sense of God and beauty and truth by some prin-

ciple analogous to natural selection means that naturalism is trying to show that these things have survived and have grown because they have "survival value," because they are useful to the human race, or to some branch of it, in the struggle for existence. But this must mean, if it be true, that our thoughts and ideals, consciousness and conscience, prayers and hopes, are causes which produce effects in the external world. It is all an unconscious denial of determinism. On the other hand, however, a thorough-going evolutionism, attempting to describe the process of growth in terms of natural selection, has to acknowledge products of the process whose survival value, to the individual or to the group, is very problematical. The power to appreciate the beauty of a landscape or a sunset, the mathematical insight that can demonstrate the general theory of relativity, the disinterested intellect that can say—

"It fortifies my soul to know  
That, though I perish, truth is so"—

the hermit's sacrifice of society and all else for God's sake—it is only by giving a very far-fetched meaning to "natural selection" that we can explain such things by its help. The goal of the struggle for existence is that which has a value different from the mere survival of mankind, or of any individual in it. That would be an intolerable paradox if it did not remind us that biological theories like that of natural selection or the various theories of heredity are, like the theories of the structure of the atom, not explanations, but only descriptive schemes imposed upon the facts by man's endeavour to arrange them.

#### BOOKS TO READ

*Outlines of Evolutionary Biology*, A. Dendy. (Constable.)  
*The Origin of Species*, C. Darwin.

## V. PSYCHOLOGY, SOCIOLOGY, AND RELIGION

**M**ODERN psychology assumes that there is no such thing as a special religious instinct or any peculiar faculty of the mind which functions only in religion. It attempts, rather, to describe all the phenomena of religion in terms of the emotions, impulses, intellectual capacities, and volitions with which we are familiar in other spheres of life. It seeks, of course, to take up a disinterestedly scientific attitude towards religion. This, however, is far from easy to do. Religion arouses strong emotions and deep convictions. Is it really possible, in relation to the things that we hold most sacred, or that we dislike most fiercely, to be merely descriptive or analytical, to take the intellectual point of view? Will a man dissect his love for his mother as with a scalpel, and if he does so, will his love remain unchanged? The scientific point of view, objective, critical, questioning, can be reconciled with the religious attitude of reverence, awe, and worship, in the same mind, at the same time, only by one who has patience, humility, a sensitive conscience, and a deep conviction that truth is a sacred thing. Any attempt at such a reconciliation, however, will discipline the mind and enrich the spirit.

The psychology of religion does not bring God's activity into its explanation of phenomena. It does not ask whether God answers prayer. It explains neither the conversion of St. Augustine to Catholicism as the work of God, nor that of Mrs. Besant to atheism as the work of the devil. God is not a subject of scientific

enquiry. When the questions arise, Is there a God? Does He do anything? psychology cannot answer. Those problems belong to philosophy.

Religion is sometimes discredited on the ground that those who have visions or revelations are mentally or physically abnormal. The fact is that many whose work has been unusually original, or of supreme value to mankind, have been abnormal. We listen to a piece of music, read a novel, or see a play. If our minds are stimulated, our emotions purified, and we are encouraged to live strong and brave lives, we say, "That was good music, a good play, a good book." It is quite irrelevant to ask, has the author a squint, or a club-foot, or is he hysterical? The origin of a thing, where it comes from, is logically a different question from its value, what it is worth. There are many healthy people who have never had any experiences like those of George Fox, or St. Teresa, or Plotinus, or Socrates. There are lots of Rugby football players, for example, who have never seen visions of angels or heard a voice from God. That fact, however, proves nothing at all about the truth of religion or the value of visions. In spiritual insight, the man whose sensitiveness goes with overstrained nerves and emotional instability may be as safe a guide as the beefy Philistine who eats well, sleeps well, plays a good round of golf, and doesn't worry.

This adverse criticism of religion by the medical materialists, however, really belongs to a generation ago, or even further back than that. The modern attack comes from psycho-analysis. According to this "new" psychology, religion is nothing more than a wish fulfilment, an illusion, a series of symbols of unconscious cravings, an externalisation of the *libido*, sublimated emotion. When I was an infant I was utterly dependent on my mother; food, warmth, comfort, protection,



teaching, all came from her. Later I looked to my father for all these deep necessities, and, for a time, I did not look in vain. I came, through long habit, to *need* the satisfaction that the words "mother" and "father" stand for. My nature, incomplete without them, insists on them. Without such fulfilment life would be, literally, intolerable. The world of fact is a cold stepmother, and so I imagine the satisfaction of my needs. That is why I call God "Father," why I trust to "Mother Church," why I say "Hail, Mary . . . pray for us sinners." And it explains why the craving for such religious satisfactions is as broad as humanity itself. Of course religion is universal, of course it represents a great human need. That is all it does represent. It speaks of the nature of man, not of the nature of reality.

Alternatively, other psychologists interpret religion in terms of the "herd instinct." Man is a social animal, the most social of all animals. We grow up, and come to maturity, in body, mind, and spirit, as members of a group. Apart from family, school, nation, church, I am nothing. In isolation I am consciously incomplete, finite, weak. So my nature craves for the infinite, for God. The universality of religion, then, is a witness to my need of God, not a witness to the existence of God.

The psychological point of view is so widespread as to be characteristic of the twentieth century, so that there is a large number of people who assume that the validity of religion has been destroyed by psychology. It needs to be said, however, that psychology can have no right to say whether God exists or not. It has a right to say, if the facts seem to justify such a statement, that men believe in God the Father because they need the comfort of such a belief. To go on to say that *therefore* this

belief is untrue, that there is no such Being as God the Father, is just muddleheadedness. The question still remains to be asked, and it is not a question that psychology can answer, Is there a God or not?

Freud believes that all our conscious beliefs are the product of unconscious impulses and desires, and that the arguments that we bring forward to justify them are "rationalisations," excuses for opinions we hold because, unconsciously, we want them to be true. He is certain that this is true of religion. But if it be true of religion it must also be true of science, of our political opinions, as well as of our belief in the laws of thought and the axioms of mathematics. It is also true of Freud's own belief in psycho-analysis, because what is sauce for the goose is sauce for the gander. Either the fact that my religious beliefs are grounded in unconscious desires is a reason for denying the truth of those beliefs, in which case I deny the truth of Freud's theory on the same ground, or the fact that Freud's belief is grounded in unconscious desires is not an argument against its truth, in which case a similar argument does not discredit my beliefs.

The psychology of religion deals, primarily, with religious experience. The Acts of the Apostles gives three accounts of the conversion of St. Paul; we read the story, so moving and so memorable, of the ecstasy of St. Francis; or some passage of Wordsworth opens to us his experience of the omnipresent. But many ordinary people have very little first-hand acquaintance with these things. There is a real danger that modern books on religious psychology should represent religion as *extraordinary*, the perquisite of those who have special spiritual capacities, whereas if it is to be worth anything at all it must be a tremendous commonplace, hidden, it may be, from the learned and the clever, but within

the reach of the farm labourer. There is, indeed, a kind of religious experience to which few of us are entirely strange. The everyday happenings of our life, beauty and mystery, joy and sorrow and love, duty and hope and failure, the experiences of body and mind and spirit, these are all united by their relation to our self and to God. The real significance of life is to be a means of communication between God and man, a revelation of God. Behind, above, our changing sense-experience, and the meaning it has for our immediate activity, there is the sense of the land of far distances, the presence of the King in His beauty. Tennyson has put it into words—

“ Many a time they come . . .  
 . . . moments when he feels he cannot die,  
 And knows himself no vision to himself,  
 Nor the high God a vision, nor that One  
 Who rose again.”

And Browning gave a similar description of the religious experience of common men :

“ Just when we are safest, there's a sunset touch,  
 A fancy from a flower-bell, someone's death,  
 A chorus ending from Euripides,  
 And that's enough for fifty hopes and fears  
 As old and new at once as nature's self.”

It is not perhaps very definite, but it is very real, and it is part of the experience of many people.

History, also, points to God whenever we seek its unity and significance. He is the larger background revealed in it, and Christians are those for whom, in Jesus of Nazareth, God is revealed most transparently. With such clues we interpret our individual lives. Duty comes as the will of God, and the daily happenings of common lives mean His loving providence. Our own religious experience, ordinary, dilute, as it were, hints

at the ineffable life of the saints. Prayer is at least akin to mysticism, and eucharistic devotion also. And faith, self-committal in trust and obedience, has seemed to some of the greatest men in the world a true gateway to reality. As the Archbishop of York is fond of saying, it is because the general philosophical argument confirms, and is confirmed by, the testimony of religious experience that we can build on the two of them together the true case for belief in God.

There are those who think to discredit religion by exposing its beginnings in the superstitious magic of savages. Many ideas of civilised man, however, such as those of mathematics and science, can be traced back, without a break, to very crude beginnings in the primitive mind. They are none the worse for that. Only when some false or pernicious idea gets specious authority as a product of a venerable tradition is it relevant to show its continuity with some baseless superstition of "primitive man." But when a man who disbelieves in immortality, so far from tracing the Christian dogma back to some primitive superstition (a long and laborious task it would be), jumps to the conclusion that it originates in the dreams of savages, and assumes that his explanation has explained the dogma away, his argument has more kinship with rationalisation than with reason.

Religion and magic begin, in all probability, in speculations about startling examples of fortune or misfortune. Whence come insanity, the unspeakable agony of strangulated hernia, the power of the medicine men, the authority of the chief, fruitful harvests, prolific flocks, earthquakes, thunderstorms, victory in war, success in the hunt? Is there a power which can be conciliated, perhaps controlled? In Melanesia and Polynesia it is called *mana*. The man who has *mana* has

unusual ability or strength; can do what is more than natural. And the ghost of the chief or priest, after his death, will have *mana* even more vigorous and ubiquitous. This power may be communicated, deliberately or unconsciously, by or to buildings, or animals, or clothes, or other material objects. All relations with the "other" world involve *mana*. The medicine man may use it for good or evil. Unless you are careful, you may touch the thing or person that has *mana*, and yourself become charged with it. Men have died through eating, accidentally, what a chief has touched. So the person or thing which has *mana* becomes *tabu*, and is not to be "unadvisedly, lightly, or wantonly" approached, touched, or used. Consecrated or accursed, they must be kept apart from ordinary activities because they have *mana*. *Tabu* is self-acting; the man who discovers that he has violated it goes mad with fright or dies of terror. Here is the main support of government and law and priesthood.

The Ark of the Covenant, in the Old Testament, is an admirable illustration of these notions. It was a wooden box, small enough to be carried about, the vehicle of supernatural power. Its *mana* divided the Jordan before the host. Brought into the army, it filled the Israelites with confidence and their enemies with terror. Captured by the Philistines (in spite of its mighty *mana*), it proved a curse and a destruction to their own sacred objects. The story of Uzzah, struck dead because with the best intentions he touched the Ark, is an excellent example of how *tabu* works. Until it finally disappeared (when and how we do not know), the Ark played a part for good and ill comparable to that of a great *fetish* or powerful *medicine* in a West African tribe.

The Hebrew word usually translated "holy" ex-

presses a notion closely akin to *tabu*. "Stand by thyself," says the Jew who has taken part in heathen rites. "Come not near to me lest (if thou touch me) I make thee holy also" (Isa. lxxv. 5). Whoever touches the most holy altar becomes most holy (Exod. xxxix. 37). Holiness is contagious, so what is holy must be kept separate. So the Sabbath, which is to be kept "holy," is a day on which the common work of the world must not be done; it is separated or consecrated. The holy place, and most holy, are places into which lay-folk may not come. The Jews are a holy people, and, therefore, will not eat with Gentiles, even when they are fellow-Christians, but "draw back and separate themselves" (Gal. ii. 12). Canon Quick has pointed out that it was a startling paradox when the Jew St. Paul expressed the very heart of the new revelation in a phrase about the *commonness* of the Holy Ghost (2 Cor. xiii. 14). The word "holy" had not yet lost its association with *tabu*.

The emotional root of all these prohibitions is the terror of the strange, the mysterious, the supernatural. There is a real difference between such hardly human terror and the ethical and rational emotion of spiritual religion. The gulf, indeed, between *mana* and a real faith in the gods, not to mention monotheism, is to be bridged with difficulty. But when terror, tempered with wonder and obedience, ripens through humility into gratitude and reverence, we have the emotional soil in which religion grows.

We are now prepared to face the notion that religion is a fundamental, and fundamentally unique, element in human nature, neither to be confused with morality or philosophy, or æsthetic experience, nor to be resolved into any combination of these things. Religion is a particular *kind* of experience, as autonomous as con-

science, or the judgment "This is a beautiful garden." It is a commonplace that if art is to be itself it must not be hampered by ethical considerations. The musician must seek to create beauty, not to be edifying. The novel with a purpose usually succeeds in being neither good propaganda nor a good novel, and just as morality and æsthetic experience are distinguishable, whether or not they are ultimately separate, so religion has a character of its own. All the different religions, from the crudest animism or polytheism to the most universal or ethical theism, involve a unique kind of contact with reality. That is what makes them religion. The word "sacred" probably comes nearest of the words in ordinary use to describing the object of this characteristically religious experience.

When Abraham is pleading with Jehovah to save Sodom, he says: "Behold now I have dared to speak unto Jehovah, *which am but dust and ashes.*" The immediate, awful presence of God, indescribable in any human words, is revealed in the sense of utter nothingness, as if one should convey the impression of a blinding light by telling of the deep shadows that it casts. So Isaiah, in the account of his prophetic call, describes without describing it the awe of the presence of God, the dreadful vision of His majesty. The angels of fire dare not look on Him; they veil their faces and they hide their bodies from His gaze. Isaiah cries out in terror. The experience is indescribable; it can only be hinted at, because it is different from anything else but the determinant element in religion, the sense of God.

This reverent dread underlies the whole process of religious evolution. However ethical or rational religion becomes, this characteristic intuition is never left behind, or religion itself disappears. There is a passage

in the first sermon in the fifth volume of Newman's *Parochial and Plain Sermons* which illustrates this essential element in religion as clearly as any passage in the Old Testament. "At times we seem to catch a glimpse of a Form, which we shall hereafter see face to face. We approach, and, in spite of the darkness, our hands, or our head, or our brow, or our lips become, as it were, sensible to the contact of something more than earthly. We know not where we are, but have been bathing in water, and a voice tells us that it is blood. Or we have a mark signed upon our foreheads, and it spake of Calvary. Or we recollect a hand laid upon our heads, and surely it had the print of nails in it, and resembled His who with a touch gave sight to the blind and raised the dead. Or we have been eating and drinking, and it was not a dream, surely, that One fed us from His wounded side and renewed our nature by the heavenly meat He gave."

It is a mere mistake, due to the natural human error of remembering what is congenial and forgetting what we cannot understand, to think that Jesus Christ represents a Divine revelation from which this element of supernatural terror has been eliminated. He tells us to fear God. He was entirely fearless, and He made others fearless. After His death, people who had had dealings with Him during His life recognised His influence on His disciples by this very mark: "When they beheld the *boldness* of Peter and John, they took knowledge of them, that they had been with Jesus" (Acts iv. 13). He often told people not to be afraid. To the disciples He said: "Fear not, little flock. It is your Father's good pleasure to give you the kingdom." They will be imprisoned and flogged, driven from city to city. They are not to be afraid. "Fear not them which kill the body, and *afterwards have nothing which*



*they can do*”—a very characteristic expression. “Fear Him which after he hath killed hath power to destroy both soul and body in hell.” Without doubt that does not refer to the devil. Christ would never tell men to fear the devil. Whatever we are to do with the devil, we are not to fear him. No, we are to fear God, and Him only. That is what makes men fearless.

In the New Testament love and fascination do not become the substitutes for, they only enrich and deepen by a psychological tension, the awe and reverence which are the root of religion. It is the amazing paradox that God is Love, which does but intensify the mystery as well as the blessedness of the Gospel. Religion is not kindness, or brotherhood, or search for beauty or truth. It is fellowship with God—reverence and love. Religion, then, is unique, an end in itself, autonomous in exactly the same sense as science, art, and morality are autonomous. But these things, though distinguishable, cannot be finally separable. It is arguable that apart from religion morality falls short of its freest and most creative achievements. Morality is rooted in sensitiveness to social requirements which, through the mechanism of suggestion, we come to feel as belonging to ourselves. It develops into the moral sentiments, the conviction that we ought to leave some things undone and ought to do other things. It becomes more spontaneous and inward when it becomes part of the “ego complex,” the self-regarding sentiment, the “larger selfishness”; we try to live up to our ideal. So the moral life becomes independent, a man dares to be a Daniel, dares to stand alone. Athanasius *contra mundum*, Luther at the Diet of Wurms, are examples. And at last this is broken and destroyed in religion. Moral progress has come about through losing one’s pride in self in the sense of God. One of the greatest moral transvaluations that Christi-

anity achieved was in making humility a virtue. The sense of sin is part of the religious sentiment. Life becomes fellowship with God, glad and painful. The fruits of the spirit are part of what the child offers His Father.

The relation of religion to morality is matter of controversy. "Many persons, such as Cellini," says Dr. Thouless, "have been exceedingly religious, and exceedingly wicked." The opposite view is stated in the well-known passage in the Epistle of St. James, which says that the true "Divine service," the pure ceremonial and cultus, of the Christian religion is to visit the fatherless and widows in their affliction, and to keep himself unspotted from the world. Socrates seems to have identified religion with morality. Worship, public or private, becomes either a work of supererogation, or it becomes a means to an end. Obviously, there is something wrong there. Every religious man knows that worship cannot be merely a means to an end, even a moral end, any more than art or science can persist if it be merely utilitarian. Whatever its fruit may be, worship is an activity that must be practised for its own sake, as an end in itself. Otherwise God becomes a mere instrument for human purposes, which is a horrid and irreverent thing. As Dunois said to St. Joan, in the fifth scene of Mr. Shaw's great play, "God is no man's daily drudge, and no maid's either," and Joan was wrong if she thought she had God in her pocket. Which is another way of asserting that religion is autonomous.

How, then, shall we define religion? All definitions of religion are arguments, postulates involved in a man's own convictions on this subject, about which people feel more keenly, and differ more widely, than about anything else. The obvious fact that religion, as contrasted with science, for example, is immediately personal, is

one reason for this difference. But another reason why religion cannot be easily defined is that it is a phenomenon more universal, and characteristically human, than almost any other. A narrow definition necessarily leaves out a great number of people, and a great number of phenomena, that are by general consent regarded as religious.

William James, in his *Varieties of Religious Experience*, confined religion to the feelings, acts, and experiences of individual men in their solitude, to what he called the more personal branch of religion, ignoring what he called the institutional branch. It may be argued that an enquirer has a right to limit the field of his research as he thinks fit, but James's division was essentially artificial. As a matter of history, religion has always been a social phenomenon. The religious community is ubiquitous, and is obvious and important even when the Deity and His personality, and the individual man and his inner dispositions, are vague. This exclusive concern with the individual man in his solitude, to the ignoring of the Church and its fellowship, and with the subjective, in contrast with the object, warps the reality, which James claims to be studying, for it destroys the nature of religion. The social elements in religion, the ceremonial, worship, tradition, and sacrament, are an essential element in it; not "trappings" (a metaphor, like a definition, is an argument), but its very body and skeleton, without which it would be an "airy nothing."

Any writer is greatly daring who adds one more to the unsatisfactory attempts to define religion. But to write such a book as this involves, inevitably, some effort to describe what one is writing about. I define religion, then, as at once social and inward, an awful experience of intercourse with the Divine, arising from, and expressed in, worship, sacrament, creed, and moral duty,

as God reveals Himself through beauty of Nature and art, through our understanding of man and the world, and through the claims of love.

BOOKS TO READ

*The Idea of the Holy*, Rudolf Otto. (Macmillan.)

*Is Christian Experience an Illusion?* H. Balmforth. (S.C.M.)

*An Introduction to the Psychology of Religion*, R. H. Thouless. (Cambridge University Press.)

## VI. THE LIMITATIONS OF SCIENCE

THE last three chapters have attempted to present, in simple and non-technical language, the picture of the physical universe, living and non-living, and of man and his religion, as modern science describes them. It is, at least at first sight, alien to Catholic theology. And it is the mental background of modern civilised men and women. As education becomes increasingly general, the people to whom the Church is called to minister will assume the picture of the universe which modern naturalism draws. The Church cannot ignore it, even if it wishes to do so. Natural science cannot be dismissed with a few smart jokes, or treated as a part of the furniture of the modern mind which ought to make no difference to a man's religion. The position seems to be this. No theology can survive which contradicts the truths of natural science. The preacher who refuses to accept the discoveries of Copernicus and Darwin makes himself ridiculous. But this does not mean that the categories of science are not to be criticised. It is the business of philosophy to discover what science means, and to point out what, in the body of scientific thought, is assumption or improbable dogma, and what is still a hope, and what is actual achievement. There is a realm of natural science, and this realm has its boundaries, its limits. It is the business of philosophy to define what these are. It is the task of Christian philosophy, with all reverence and gratitude, to teach natural science its place.

The first consideration without which the validity of natural science cannot be adequately estimated is that

the whole system of physical knowledge rests on fundamental principles which, although they cannot be denied, or doubted, or treated as unimportant, cannot be proved nor taken as self-evident. We all believe that other persons besides ourselves really exist, that they are not merely part of our private dream or nightmare, and that social life is an important fact. We believe that we and these others all inhabit, and by our senses are aware of, the same physical world, which is extended in space and persists in time, although it changes, that these changes exhibit considerable uniformity, and that the world in which we live can only to a very small extent be controlled or affected by us. All this we believe, although it is unproven and unprovable. The late Lord Balfour reiterated, throughout a long life, the challenging assertion that people criticise and reject religion and theology because they start from unprovable assumptions, although they accept with humble docility the world-view of science based on assumptions equally unprovable.

The next thing which appears as a result of a critical examination of natural science is that, having assumed the reality of the physical world, it takes the facts of experience as they are and rests the whole rational system of laws and theories upon them. There are certain *data* of the senses—things that are *there*—and we have to start by accepting them as they are. We do not know why things are what they are. We do not know why this or that should exist, and why something else does not exist. The chemist tells us that hydrogen and oxygen combine to form water. We take his word for the fact—but neither he nor anybody else can explain *why* they behave in this way. Beneath and behind and within all scientific reasoning is the irrational *fact*—the brute existent—that has to be taken for granted. The existence of the whole universe is, in

this sense, irrational. The truly incomprehensible thing, as D'Alembert puts it, is that anything should exist at all. William James points out in one of his books that we cannot conceive the relation of everything to nothing, of being to not being, of what exists to what does not exist. And natural laws themselves are in this sense mere facts, inexplicable, non-rational. The Newtonians define the law of gravitation by saying that every particle of matter in the universe attracts every other particle with a force that varies inversely as the square of the distance between them. But it is not possible to prove why the force does not vary inversely as the cube of the distance between the particles. Natural laws are what they are. *Why* they are we do not know. The same line of argument applies also to the laws of thought. We cannot conceive that a thing can both be and not be at the same time. That is the way the human mind works. But no mind understands why it works in that way. The data of sense, natural laws, the existence of the universe, the laws of thought—all are what they are, and we do not know *why*—and we do not know *why* they are at all. The existence of the actual, Troeltsch says, must be referred to the arbitrary *fiat* of the Deity. This line of thought was emphasised by early Christian philosophers. God is not limited, they held, by universal laws, but actually expresses the most profound elements in His self-revelation—His freedom, His “initiative,” His grace—in the concrete existences that in their individuality elude those laws and are the basis of them. In later centuries thinkers divided into two schools, one emphasising the reality of the particular, individual thing, while the other stressed the importance of classes and species. Quite consciously, one motive impelling the former, the Nominalists, was an interest in maintaining the freedom

of the Divine will. The existence of particular concrete things plays havoc with any kind of thorough-going rationalism, and the mere fact that genuinely new things "emerge" in the process of evolution and history reveals in the very heart of causality itself an element of the inexplicable, something that defies reason, that has to be accepted with "natural piety," to use Professor Alexander's phrase. The universe is not entirely rational. Freedom may be a fact as well as an ideal. Determinism, Troeltsch has said, is never more than a deduction from the mistaken assumption of the abstract rationality of things, so that the reminder of the element of non-rational fact at the heart of things implies the creative freedom of God, and the living freedom of the universe in God.

The third statement, which defines the inevitable limitations of natural science, is that it can only deal with events and existences in the real world by a process of abstraction. The actual world of our experience is, to adopt a phrase of William James, "a big, buzzing, blooming confusion," so rich, varied, large, and complicated that to get any order at all science must ignore what it cannot arrange. This means that science is related to the actual world very much as a map of a town is related to the town. A map of York is in many ways *unlike* York. It ignores the history, the beauty, the political needs and aspirations, the moral ideals and the intellectual tastes of that ancient city. On the map a road is a double line, curved, or straight, or crooked, between black dots. In the city a road is a very different thing, full of the tragi-comedy of human life. There is much in the city that is not in the map. Yet the map may possess a great deal of practical truth. If it helps me to relate myself aright to the actual city, to go about my lawful business in it at the right times and without



mistake, to be at church at service time, at home at lunch time, at the railway station to catch a train, then I say it is a correct map. It may have all the truth a map can have and yet not have all the truth there is. Similarly, because science works with abstractions, it may have very valuable practical truth, and yet be compelled to ignore much that is important in a complete view of the world.

The first kind of abstraction which science involves is due to its dependence on classification. Everything that exists is different, in some ways, from everything else. Every event which happens is unique, in some respects at least. Because science seeks resemblances, however, in things and happenings, for only so can it arrange them under laws and general theories, it must always miss and ignore the unique thing, or person, or event. "Nelson won the Battle of Trafalgar." "Christ walked on the water." There can be no science of those events, because they are unique. And because everything is more or less unique, because everything is individual, and neither nature nor history repeats itself, the concrete actuality of existence always slips through the net of science. We experience the individual and unique thing; every moment has its own peculiar difference; but all that science can define and describe is that in which the experience is not unique, that in which the moment is not different. Its tools are universals. The further science goes, then, towards its goal of one absolutely comprehensive generalisation, under which all that happens can be subsumed, the more inadequate, because the more abstract, does its account of reality become. It misses all the MEANING of the universe, for it is in the HERE, the NOW, and the THIS—in what is itself gloriously different from everything else—that we contemplate meaning and create it. And, especially,

science is impotent to deal with the most truly individual experiences, the living organism, the human being, the self-determining personality. In that sphere the scientific method has little place.

There is a telling illustration of this last point in an article in *Harper's Magazine* for June, 1930. Mr. Walter Lippmann, the famous author of *A Preface to Morals*, explains the peculiar weakness of Mr. Hoover as due to the fact that he is an engineer by profession "who believed that politics could be conducted by the kind of intelligence which has produced such excellent motor-cars, airplanes, and refrigerators. The faith that statesmanship could be made a branch of engineering would, of course, be more congenial to an engineer who had moved mountains of matter than to an experienced statesman who had tried to move mankind out of its ancient habits. The religion of progress is, in fact, a creed inspired by the history of man's triumphant conflict with matter plus a certain subconscious belief that as a source book of wisdom the history of man himself is bunk." Because science has to ignore the differences between things, and to emphasise the similarities, it is much more successful in describing the behaviour of molecules of gas in motion, where the differences are relatively unimportant, than in describing and forecasting and controlling the sins and heroism of human beings, among whom the similarities seem less striking the more the individuals are studied.

Another abstraction which is inevitable in natural science is that it classifies things and happenings on the basis of exact measurement. In practice, this means that its great instrument is the rule divided into centimetres. Science *spatialises* everything. It measures mass by the place of a balance-pointer on a graduated scale. It measures electricity and magnetism with a galvano-

meter—*i.e.*, by the movements of a spot of light on a scale. It measures time by the place of a hand on a dial. And what it cannot measure it can hardly use, for mathematics are the basis of all its classification, and laws, and theories. That this is so, even in the biological sciences, is seen in the progress made in bio-chemistry and bio-physics, and in the application of mathematical methods to the phenomena of life by the Mendelians. "Practical psychology," or the application of laboratory methods to the study of behaviour, attempts to do the same thing for the mind, but it never succeeds in doing more than measure the physical accompaniments of emotions, thoughts, volitions, and of the changes in them. The truth is, of course, that exact measurements can deal only with quantities, and are inapplicable to qualities, and, similarly, they are confined to the material and the physical and can take no account of the mental and spiritual.

We have arrived, then, at the popular assertion that science has to do with facts and cannot deal with values. It is a statement which has truth in it, but, expressed in this way, it opens the path to an important misunderstanding. It is true that science cannot deal with values. It can say that life cannot exist on this planet above a certain temperature, but it is unscientific to go on and say either "alas!" or "hurrah!"

The facts about birds and flowers are the concern of science, but with the beauty which lifts man's heart in gratitude the scientist, as such, has nothing to do. But the beauty is a fact. And gratitude, and joy, and sorrow, and hatred, are not unimportant in the world. Life and history would be different if values had not been what they have been. That science cannot deal with them is only a proof that it is an abstraction from the full reality of the actual world.

Another element of abstraction is introduced into science by the deliberate elimination of the individual observer. The theories of science, indeed, find their occasion in, and so apply to, the finite experience of a possible individual. But science proceeds at once to insist that it deals only with those experiences which are the same for all observers, or would be the same for all observers in the same, or similar, circumstances. It is, of course, a large assumption that there are any such experiences, but scientists begin by making it. In his valuable and well-written book, *What is Science?* Mr. Norman Campbell lays down this definition: Science is the study of those judgments concerning which universal agreement can be obtained.

All that is private and peculiar is eliminated. The "time" with which science works is a "general time" abstracted from the private times of particular observers. That is the chief reason that science can treat the distinction between before and after as insignificant, for the individual has an immediate feeling of a difference in quality between past and future. At only one point, in the second law of thermodynamics and the conception of entropy, does science face the fact that the relation between to-day and to-morrow is different from that between to-day and yesterday. Similarly, scientific space is "generalised" from the private spaces of individuals, each of whom feels the obstinate, inexplicable distinction between RIGHT and LEFT, a qualitative difference which has disappeared in the abstract space of science. But all experiences are, after all, the experiences of individuals, and when science, abstracting from such data, offers descriptions of what necessarily eludes the confirmation of any one individual, its speculations become very doubtful. Theories which describe what has taken millions of years to achieve, whether the evolution of

man, or the development of the solar system, must be very largely hypothetical.

We have hinted several times already at what is the most important respect in which science is abstract, and therefore defective as an account of the actual world. Science ignores personality. It describes the world as it would be if mind—the mind of animals, or man, or God—made no difference to anything that happens. It is difficult to believe that this is so. Anybody who stands in the National Gallery and looks at Turner's "Fighting Téméraire," or sees a performance of Shakespeare's *Midsummer Night's Dream*, or contemplates the nave of York Minster, and is able to believe that these things would be what they are if there had been no human minds, is a person who can believe anything. But science has a dogma called the uniformity of nature, which is supposed to rule out, as an impossible or at least an unnecessary hypothesis, the effective interference of mind in any chain of material causation. It is its purpose to show that the present state of matter and energy in a system is the result of some previous arrangement of them. It is almost in the position of identifying *post hoc* with *propter hoc*, but, in any case, the natural sciences ignore mind as a true cause in the world, as Socrates complained that they ignored it in his day.

It has been pointed out already (p. 59), that this implies a fundamental inconsistency in the scientific account of the universe.

It also needs to be said that if natural science ignores personality, and describes the world as it would be if mind made no difference to anything that happens, it is ignoring all that is most important and valuable and significant in our experience. The facts, and laws, and theories with which physics, and chemistry, and biology deal are important to a man. He must live in accord-

ance with them if he is to live at all. But even more important are the aims and motives, the ideals and ambitions, the fears, and loves, and hates of himself and other human beings. The nationalism, the trade rivalries, the foolish "cleverness" and the "learned ignorance of diplomatists, and the other human causes of the Great War, have made a great difference to the life of every civilised person. A man's home, his school, his church, his political party, his club, the town he lives in, the books he reads, the games he plays, not to mention the work he does for a living, the clothes he wears, and the money he spends, these things are personal through and through, they express values, emotions, and ideals, they touch his life at every point, and they make far more difference to the quality of it, to his happiness or enjoyment of it, than do science and all its laws and theories. Science is important as dealing with the means to human ends, without it we could not achieve our ends, but, obviously, the ends themselves are important in a more fundamental way.

People often make a mistake on this very point. It has been said that science is fundamental to the satisfaction of all our needs because its aim is to establish dependable knowledge of the relations of things. It tells us what causes produce what effects, what conditions are necessary to what results, and so on. Whatever our aims may be, then, whether they are moral, æsthetic, economic, or political, or deal with games, or cooking, or wine, or foreign travel, we make use of science, "the dependable knowledge of the relations of things," to achieve our ends. Science, then, is fundamental. Without it we cannot live, or paint, or write poetry, or fly to India, or manage an oil shop. It represents a value fundamental to all other values, so that when this is fully realised it will, inevitably, play a dominating rôle.

The fallacy in all this springs from the lack of clear thought about the word "fundamental." The most urgent things are not the most important. What is necessary, as a means, is not proved, by that fact, to be as "fundamental" as the ends which it serves. There could be little life without food. Food, therefore, is an urgent need, but food is not the most important thing in the world. There are things, indeed, for which a man ought to be prepared to starve. Grammar is an essential condition of most poetry, but grammar is not more valuable than poetry. Many values could not be realised without science, but that does not make science most valuable, for science, as we have seen, has nothing to say about values.

"Science is true," says Dr. Norman Campbell in *What is Science?* "whatever anyone may say; it has for certain minds, if not for all, the intellectual value which is the ultimate test of truth." We are now in a position, however, to define in what sense science is true. The two fundamental characteristics of science are: first, that it arose in the attempt to satisfy the practical need of controlling and using our physical environment, so that the test of science is its practical success, and, secondly, that it is, of necessity, abstract. The world in which we live is infinitely varied, full of individuality, so richly complex that we can never be certain that we know all the causes and conditions of any actual event, whether natural or human (and what we do not know may be more important than what we do), a world which is what it is because it is shot through with beauty and tragedy and heroism and sin. And science ignores all this, because only so can it deal with the world at all. It is a description of a world in which nothing exists except in so far as it is a member of a class, exactly like every other member of the same class, in which every

effect is completely known, and known to involve nothing new, nothing that was not in the cause, in which all is clear and distinct and rational, because everything can be measured.

The truth of science, then, of all its laws, and theories, and dogmas, is purely practical. For example, physics holds that all matter is made up of discontinuous atoms, which are ultra-microscopic, and that each atom is a complex system of positively charged nuclei and negatively charged electrons in elaborate dynamical equilibrium. What does that mean? Nobody can ever perceive these electrons—they are far beyond the compass of our senses, even when we are aided by the most powerful microscope. But the theory means that for the *purposes of physics*, or of one department of that science, the universe behaves as it would if these were the facts about it. (It seems probable that the phenomena of elasticity are more easily described in terms of a continuous, rather than of a discontinuous, matter.) Physicists have constructed a mental working model, which, if it actually existed, would produce the same results, so far as physics can take knowledge of them, as are observed in the actual world. But the actual truth may, for all we know, be quite different. Science observes a fact A. It proves that if  $x$  and  $y$  exist, A would result. It therefore assumes that  $x$  and  $y$  exist, until a more simple possible explanation of A has been found. Forces, causes, atoms, electrons, are not existing things discovered in Nature, but figments, constructed by the mind in order to provide a working model which, if it existed, would produce the results actually observed in Nature.

We can see now, therefore, what we ought to mean when we say that a particular scientific law or theory is "true." It can never be applied with absolute precision



to concrete cases in Nature. Partly because science has to ignore individual things, and can only take account of general classes, but also because a scientific theory is constructed by the mind and imposed on the facts rather than found *in* the facts. Strictly speaking, then, a scientific theory is not rightly described as "true" or "false." Is the theory logically coherent? Is it more simple than its rivals? How far does it describe the facts of observation? Those are the kind of questions that we can rightly ask. And "science" is the more or less coherent system of statements which have survived that sort of cross-examination.

Science is useful; the question whether it is true is not important—for the scientist. In itself, and in its aim, it is practical. It has the value which a tool has, which a road has, which a map has. It is an artificial creation of the mind, devised, not to obtain knowledge or provide truth, but to control Nature. It has been neatly said that science bears fruit; it does not bring light. Its soul is utility. It is a labour-saving device, justified if it gives man comfort, and long life, and enough to eat. Without science we could not bring wheat from America to England, or mutton from New Zealand, and we could not foretell that there will be rain to-morrow. It is also true that without science the Germans could not have sunk the *Lusitania*, nor could the allied aircraft have dropped bombs in the streets of German towns. But that is a different story. Science is practical; for all scientists know, reality must for ever escape them.

One comprehensive illustration of this last point may, perhaps, be allowed. For the purposes of physics, a man could be described as a system of points of force in more or less definable positions. For chemistry, he is so much fat, and water, and sugar, and proteid matter. For

biology (perhaps—this is still matter of controversy) he is an organism, the parts of which can only be understood in terms of the practical unity of the whole. There are other, more fundamental, aspects of a human being about which science can say nothing, if only because they are not measurable. Science can say nothing about his conscience, or his immortal soul; but that is no reason for doubting their existence. Similarly, mathematics and astronomy, *for their own purposes*, describe the universe without mentioning God. But that is, in itself, no reason for doubting His reality.

Two limitations, then, we can lay down for science, without any fear of contradiction. First, within its own sphere its aim has been practice, not theory, and its success, as a means to useful control of things, is, in itself, no guarantee of its truth. The history of science shows that at different times so many markedly contradictory things have passed for science that to be "science" is little claim for truth. Ptolemy's astronomy was undoubted for more than a thousand years, and the world managed with it very well until Copernicus provided a more simple description of the universe. And, lest anybody should think it enough to retort that those were the "Dark Ages" when the Church kept the human mind in bondage, quite modern instances might be taken. The revolutions in physics during the last thirty years make that staid science resemble a South American Republic. Where is the Newtonian account of the universe, and the orthodox dynamics, and the atomic theory, and the conservation of matter, and determinism? Gone, all gone, like the snows of yesteryear. Einstein and relativity, Rutherford and Bohr, and almost innumerable electron theories of the atom, and not least important, from a philosophical point of view, the notion that natural laws are only statements of

statistical averages, and that there is an element of indeterminism even at the heart of inorganic nature,<sup>1</sup> have forced plain men to doubt whether science be true. Let us be content to ask whether it works.

The other obvious limitation of natural science is that there is, quite certainly, much in experience, and much that is most important, which science cannot deal with at all. Religion, and poetry, and friendships, and revenge, and the love of truth, are all part of reality, and produce results even in the physical world. They are more important in human life than any of the things which science can measure or classify. Philosophy, in seeking the truth about reality, must take account of them, and find a place for them. If it must also take account of science and find a place for it, as it must, that does not mean that science can lay down the conditions on which alone what is extra-scientific or, as it is usually called, metaphysical may exist. This chapter has made it clear that there may be reality and truth of which science knows nothing.

<sup>1</sup> Sir A. S. Eddington declares that "in so far as supernaturalism is associated with the denial of strict causality . . . that is what the modern scientific conception of the quantum theory brings us to."

#### BOOKS TO READ

*Science and Method*, L. Poincaré. (Nelson.)

*The Domain of Natural Science*, E. W. Hobson. (Cambridge University Press.)

*A History of Science and its Relations with Philosophy and Religion*, W. C. Dampier Whetham. (Cambridge University Press.)

## VII. IS THERE A GOD?

GOD made me and all the world. That is true, or there is no such thing as truth. Either Nature, and man, who is a part of Nature, and the mind of man, which claims to measure the space and time of a boundless universe, and his spirit which challenges eternity, either these are the outcome of mere matter and physical energy, or the source of them all is Personal Spirit. There is no third possibility, because, for the purposes of this argument, I include such conceptions as unconscious will or the *life force* with the anti-spiritual. If the source of all things be Creative Personality, good, and willing that goodness shall be diffused and multiplied, so that the end of creation is a free fellowship of free spirits, then it is reasonable to suppose that man has the capacity for Truth; not merely for that manipulation of facts which is a mode of expediency, a weapon in the struggle for life, but even more for the recognition of that eternal reality which is the final cause of his being, his home and his heaven. If there be no other ground and cause of existence, however, than the irrational, the meaningless, the unconscious, the blind—matter and force or, at highest, a mere impulse—then there is no reason to believe that our reasoning arrives at truth rather than error. Particles of matter in motion, the discharge of quasi-electric forces along the paths of least resistance in the brain, predetermine all our thoughts. They are the cause of my theism, and of Mr. Bertrand Russell's atheism, and neither is more true or more false than the other. If man's being be rooted in the non-spiritual, indifferent to truth, not only because it is unconscious of it, but because there is no such

thing as truth, then it is only a self-contradictory futility for him to seek for any such thing. Without theism there is no truth to be sought.

Every statement we make implies the being of God. The way of understanding, then, is not to argue from the world as effect to God as cause, trying to prove the perfect from the imperfect, the absolute from the contingent, the spiritual from the physical. Newman used to say that he believed in design because he believed in God; he did not believe in God because of the evidences of design. That expresses the point exactly. At best our knowledge of the external world reminds us of Him who is nearer to us than we are to ourselves. Plato, and St. Augustine, and Spinoza, and the whole Biblical tradition agree that it is an inalienable part of human nature to know God. Their dispassionate verdict is that it is the fool who says there is no God, the man who lacks what is most essential to man. It seems very strange to the self-styled "modern" thinkers, who draw a pathetic picture of themselves as sincere and eager, but disappointed, seekers for God, that the Bible never tries to prove that God is, and, indeed, contains a vivid description of the fruitlessness of trying to escape from His terrifying presence.

Our knowledge of the external world reminds us of God. There are many, indeed, who think vaguely that "modern science" has made faith more difficult. The Christian religion in particular, it is thought, is committed to a "scheme of salvation" which fitted a pre-Darwinian, pre-Copernican view of the universe, but is not easily conceivable in the world that Einstein and Whitehead describe for us. Dante's great poem, for example, probably represents the kind of picture which most educated men had of the physical universe for fifteen hundred years after Christ and for two hundred

years before Christ. The earth is the centre of things. Around it revolve the spheres which carry the sun and the moon and the planets. Outside there is the sphere of the fixed stars, and beyond this the *primum mobile*, paradise, and the empyrean. The universe, on this view, was vast, but it was definitely finite. Most important of all, the earth was the centre of things. Man could believe in the uniqueness of his own destiny. The great tragic drama of the Fall, and Sin, and Redemption, of Paradise Lost and Golgotha—as the Catholic Church placarded it before the human race—was credible on such a stage.

That thought of the universe had held sway, practically unquestioned, for seventeen hundred years. In the century and a half after 1450 it disappeared with a rapidity and a completeness which leave the imagination devastated. Giordano Bruno declared that the physical universe occupies infinity. The earth, which had been its centre, was seen as a fleck of mud attached to one bubble of gas among an infinity of suns, each, Bruno thought, with its own attendant planets. It was thought probable that on millions of different planets conscious life had appeared. Man was no longer God's only son. The catholic scheme of things was not disproved, but it was discredited. Men could not any longer consider the possibility that it might be true.

In his play, *Emperor and Galilean*, Ibsen describes a dream of the Emperor Julian—the Apostate. He dreamed that he ordained that the memory of the Galilean should be rooted out from the earth and that it was rooted out. Then, in his dream, he soared aloft till his feet rested on another world. And behold! there came a procession by him on the strange earth where he stood. There were soldiers, and judges, and executioners at the head of it, and weeping women fol-

lowed. And lo! in the midst of the slow-moving array was the Galilean, alive and bearing a cross on His back. Then Julian called to Him and said: "Whither away, Galilean?" But He turned His face towards him and said: "To the place of the skull." Where is He now? What if that at Golgotha, near Jerusalem, was but a wayside matter—a thing done, so to speak, in passing, in a leisure hour? What if He goes on and on, and suffers, and dies, and conquers again and again, from world to world? That is, indeed, exactly the difficulty which the post-Renaissance world felt about the Catholic faith. The Incarnation and the Atonement are not really credible unless they are unique. Once such things become habitual, they become meaningless. Man himself had lost, not only his uniqueness, but also his importance in the scheme of things. It was not really credible that the God of an infinite universe cared enough for "a third-rate planet attached to an insignificant star" to become incarnate on it, and to die "for us men, and for our salvation." An infinite physical universe had so overwhelmed man's imagination that the other world became unreal and dim. For the mediæval man, whether he were particularly pious or not, God and the angels and the saints were *there*, at least as real as himself and his friends. This present life was a preparation for, had its issues in, heaven or hell. All conduct had its inspiration, and its sanctions, in eternity.

The modern world is different. In spite of the fact that St. Ambrose, and John the Scot, and many another had taught that Heaven is more a state than a place, and that the distance between the saved and the lost has no connection with space, the theory of the infinity of space probably did more than anything else to produce the characteristically modern indifference to the supernatural. In the Middle Ages, religion used to be the focus and

unity of every activity. Industry, business, art, the drama, charity, politics, were all alike the concern of the Church, and centred round it. Increasingly, during the last four centuries, these activities have become secularised. They get their inspiration and sanction in this present world. Religion tends to become one activity among others, and as often as not it gets crowded out of a busy life.

The spiritual reaction of the most modern view of the universe, so far as it really impresses the imagination, is not quite the same as that of the synthesis achieved by Bruno, Copernicus, Galileo, and Newton. Einstein and the relativists have taught us to think that the universe is not infinite. It is very large, of course. The solar system is a mere speck in it, with an inconceivably immense gulf between it and the nearest stars. And yet—there is an infinite difference, especially for the “feel” of the thing, for its effect on the imagination, between an infinite universe and a finite universe, however large the latter may be. We live in a finite universe, and, as Mr. Chesterton once said, it is only a question of what our standards of measurement are, whether we speak of the terrifying immensity of this vast universe, or the snug comfort of this jolly little universe. There is an essential vulgarity about allowing the imagination to be impressed by mere size.

The most up-to-date cosmogony, if it does not exactly postulate a creator, at least leaves, rather obviously, logical room for such a conception. As most people know, although they do not always recognise the implications of the fact, physical energy in all its forms is only available when, and in so far as, there is a difference of “potential.” Water power can be used when you have a difference of level; as it passes from the higher to the lower, work is done. All the water in the



world *at sea-level* would be of little use. But a running stream, or the Niagara Falls, can be harnessed to do useful work. Similarly, heat is useless except where there is a difference of temperature. Electricity is power when there is difference of potential.

It seems to be an undoubted fact that the world's energy is seeking, and finding, a common level. It is becoming gradually diffused. Beside the old generalisation that energy is indestructible, we have to put this comparatively novel idea, that it is ever becoming less available, and, so far as we know, this process is, on the whole, irreversible. Heat is tending to a common temperature, electricity to a common potential, and science cannot indicate how, originally, differences of temperature, potential or kinetic energy arose. The universe is like a clock which is running down. It is now half run down. Nobody ever winds it up. It cannot wind itself up. In time it will stop. "It must at some time in the past have been wound up, in some manner unknown to us." So writes Sir J. H. Jeans. The author of the first chapter of Genesis filled the gap. "In the beginning God created the heaven and the earth."

Evolution, as it has actually taken place, seems inexplicable except on a spiritual interpretation of the universe. Consider the story as science presents it to us. The universe began, not with nothing, nor with complete homogeneity, but with moving molecules through space, with a "gravitational instability" here and there which had been produced by some cause or causes unknown. The astronomer attempts to show how, from this state, first nebulae and then stars may have arisen, and how from one star the solar system may have arisen. He shows how a molten streamer drawn off from the sun may have produced the planets, including the earth

and its satellite; how the earth, originally a ball of gas, developed into its present condition, with a solid crust, continents, oceans, and an atmosphere fifty miles thick. There is considerable controversy about each stage of the story up to this point, for it is very largely speculation based upon mathematics. Then life appeared, we know not how, or whence. From the unicellular organisms the development is shown of the whole vegetable and animal kingdoms, until at last man appeared. Then the history shows the development of civilisations, of religions, of ethical systems, until we reach the present day. What evolution aims at doing, therefore, is to explain Shakespeare, and Einstein, and John Henry Newman as the products of moving particles in motion. And the only possible comment is that it is impossible. To begin with this, matter in motion, and to end with that, holiness, and genius, and a supreme analytical intellect, is to put together things which are completely discontinuous, however much one may try to hide the fact by putting innumerable small discontinuities in the place of one large discontinuity. The miracle does not become any less miraculous if it is spread over millions of years and divided into a million smaller miracles. To evade the difficulty in that way is to attribute a creative power to the mere passage of time which it does not possess. The human mind is not satisfied to accept matter in motion as a sufficient explanation of holiness and genius. The interesting mental mechanism of "cause and effect" is like every other kind of machinery, in this respect at least, that you cannot get more out of it than you put in. You cannot put in particles in motion and get out "man's all-subtilising intellect," any more than you can put fifty per cent. of bread into a sausage machine and get out seventy-five per cent. of pork in your sausages. We can only account for the

appearance of the higher if the highest has been always real. Space and time can lead to Deity only if God be the eternal ground of the whole evolution. The ground of the whole process, present before it began, and making possible every new achievement, is a mind and spirit at least as high in quality as the highest product of the development. Evolution means God.

The conviction that every statement that we make implies the being of God, and that there is no such thing as truth if theism be not true, is met and confirmed, then, by our knowledge of the external world. Nature, when allowed to speak for herself, proclaims "her great original," and the "wider teleology" rests on scientific generalisations. To the evidence of evolution, taken as a whole, we may add the more elementary and fundamental fact, that the world is more or less intelligible. This is very remarkable. It might have been a mere chaos in which things or events could not be classified because there were no resemblances between them, and in which science, therefore, would be a mere parlour game, with no application to the actual world. The world allows itself to be thought about (p. 15). As was suggested above, this in itself suggests that it was created by God.

In the third chapter of this book there is an account of the history of the universe before the appearance of life on this planet. Through thousands of millions of years the inorganic environment of life was coming into being. Then together, and at the same time, the conditions came which made life possible. The one small range of temperature; an atmosphere with clouds in it; the earth's surface with water on it, but not completely covered by it, so that there is shallow water near the shore; carbon, hydrogen, oxygen, and nitrogen, present in the appropriate compounds; these were the conditions

without which living organisms would be impossible. The conditions were present, and life appeared. From these facts an impressive argument can be drawn for believing that God created the universe in order that there might be life.

And the world was made, not only for life in general, but for man especially. It is not only remarkable that we can think about the world, and that the mind can recognise law in Nature. It is still more remarkable that the spirit of man can make beauty out of Nature. As long ago as 1871, in a famous Oxford University Sermon, the late J. B. Mozley stated this argument most impressively. In the first volume of his *Gifford Lectures*, a very great book, Lord Balfour put it in a new form. In the contemplation of any work of art, the æsthetic experience, the recognition of beauty, involves the more or less explicit communion between the mind of the beholder and the mind of the artist. This is involved in the description of beauty as *significant* form. Similarly, the recognition of natural beauty, in sunset, or storm, or a mountain range, or a wooded valley, means at least an implicit communion with the Creative Mind. From the beginning, apparently, religion has been impressed by the sublimity of Nature as a revelation of God; and to-day we can see in it a peculiar expression of God's care for man. "If Nature's beauty embody a purpose of God, it would seem to be a purpose for man," says Dr. Tennant, "and to bespeak that God is mindful of him."

Perhaps the best-known statement of positive atheism in our time is that of Mr. Bertrand Russell, in the essay called *A Free Man's Worship*. It has been referred to as great eloquence, but it seems a little too shrill and hysterical to be quite first-class. Mr. Russell paints a highly coloured picture of the purposeless world, void of meaning, which Science (with a capital S) presents for

our belief, but he does not think it necessary to remind his readers that science, by the very conditions of its work, is disqualified from saying anything at all about purpose or meaning. The universe is the outcome of accidental collocations of atoms (but the word "accidental," Mr. Russell forgets to remind us, is not science, it is *his* philosophy). And yet, by some wonder, man is gifted with sight, with the knowledge of good and evil, with the capacity of judging all the works of his unthinking mother (the universe). While he lives, man is free "to examine, to criticise, to know, and in imagination to create. To him alone, in the world with which he is acquainted, this freedom belongs." The essay ends with the paragraph that has made it famous :

"Brief and powerless is man's life; on him and all his race the slow, sure doom falls pitiless and dark. Blind to good and evil, reckless of destruction, omnipotent matter rolls on its relentless way; for Man, condemned to-day to lose his dearest, to-morrow himself to pass through the gate of darkness, it remains only to cherish, ere yet the blow falls, the lofty thoughts that ennoble his little day; disdaining the coward terrors of the slave of Fate, to worship at the shrine that his own hands have built, undismayed by the empire of chance, to preserve a mind free from the wanton tyranny that rules his outward life; proudly defiant of the irresistible forces that tolerate, for a moment, his knowledge and his condemnation, to sustain alone, a weary, but unyielding Atlas, the world that his own ideals have fashioned despite the trampling march of unconscious power."

The trick is almost too obvious. Modern science, which first became fully conscious of itself in Descartes, ignores the moral and the spiritual of deliberate intention and confines its attention to what can be measured. Then Mr. Bertrand Russell, who is known as an expert

in philosophy and mathematics, who identifies logic with mathematics, and holds that philosophy should be merely an inclusive statement of the results of science, who happens, also, to be an atheist, says that the view of the universe which modern science presents does not include meaning, or purpose, or spiritual value. It follows, he states, that man, with his moral and spiritual nature, has no root in reality; he is merely a temporary and pathetic accident.

It is, surely, most irrational! Man's knowledge of good and evil, his inward freedom, are facts, on Mr. Russell's own assertion. Man is a product of the universe; the universe is his mother, to use Mr. Russell's own metaphor. What kind of universe is it which produces morality, and freedom, and a sense of beauty and a loyalty to truth? You cannot, by any process of logical juggling, get them from "accidental collocations of atoms." And if that is all that science can see in the world-ground, there must be things there that science cannot see. Man, as Mr. Russell describes him in his famous essay, forcibly suggests, and would be explained by, a world-ground which is an intelligent and purposive spirit, personal, self-conscious, ethical, with that kind of unity which we call a character. The cause we postulate must be adequate to produce the effect we are seeking to explain. It is reasonable to believe, therefore, that there is a God.

That is all we have attempted to show in this chapter. We have arrived at the conclusion that the limitations of science are such that an adequate interpretation of experience must take into account much that science cannot but ignore. It has been the argument of the present chapter, that when that "something more" is considered along with the results of science, there are good grounds for theism. A sketch of how this bare minimum of

faith is filled in by an orthodox Christian who has a general acquaintance with modern science is provided in the concluding chapter of the book.

A BOOK TO READ.

*Philosophical Theology*, F. R. Tennant. Two volumes. (Cambridge University Press.)

## VIII. THE TRUTH OF CHRISTIANITY

THERE is a very great deal of disagreement, among thoughtful men, as to whether there is a God or not. People do not disagree about whether two and two are four or whether two straight lines can enclose a space, but they do disagree about the fundamental statements of religion. Further, the grounds upon which I myself believe in God all involve judgments of value. If the reader will glance again through the previous chapter he will see that the arguments there considered depend on convictions about the worth of personality, the meaning of beauty, the authority of conscience, the value of truth. These things are spiritual realities, spiritually discerned, and logic has very little concern with them. If a man does not believe that personality is sacred, or that Yeats's *Innisfree* is beautiful, or that stealing is wrong, or that a man who gave his life to advance human knowledge was not a fool, well, one can put examples before him in the hope that he will see them, but, if he still disagrees, there is very little more that we can do. A man's judgments of value or worth, his convictions about what is worshipful, are intensely personal and individual. It is only because we believe that mankind is fundamentally spiritual, and fundamentally one—an organic unity, and not a collection, like peas in a bag—that we believe that these intensely spiritual convictions are an avenue to reality and give us "objective" truth. But that itself is a mystical conviction, only justified if God is the Father of all men, not merely in the sense that He created them, but in so far as they are being made in His image.

A reasonable case, however, can be made out for



theism. But so far as that is true, it carries us, inevitably, a step further. As we interpret the universe as if God exists and created it, we are left with this dilemma. Either that is all, and God is merely a thought in men's minds, a way of looking at things, or God is an *active*, personal Being who does things, who makes a difference in men's lives; in other words, who reveals Himself to men. A belief in revelation is an essential part of any system of theism. A conspectus of the actual systems of religion which have existed in the world would confirm that.

God is, and God created man for Himself. Man's chief end is to glorify God, and to enjoy Him for ever. Every personal relationship must involve self-disclosure on both sides. The relation between God and man means not only that man can discover God, but that God takes the initiative to show Himself to man; nay, more, that by the grace of a real Divine fellowship man may be quickened to live the supernatural life. This is the meaning of positive religion. And the revelation which culminated in Christianity means that the omnipotent love of God will not submit to be thwarted by man's sin, but meets it with a new initiative of redeeming love, which culminated in the atoning sacrifice of God Incarnate on Calvary.

It is all rational enough, implied in the concepts of a Creator and of personal relationship. But it involves miracle, and that is where scientists think that they have a criticism to offer. A particular revelation seems, necessarily, to be a miraculous revelation, and in any case the Christian revelation claims to be accompanied by, and in part to consist in, miracles. This statement means almost nothing in itself, because the word "miracle" is so entirely obscure in its meaning. The best definition of a miracle with which I am acquainted

is that of Professor A. E. Taylor, who says that it is an event in which "the character of a Divine purpose underlying the whole course of events becomes exceptionally transparent." Religious and philosophical critics of miracles sometimes take the line that to insist on them is virtually to give up the natural as not being Divine and to be content to assert God's control of the supernatural. The truth is, rather, that the philosophical denial of miracle implies that God is entirely immanent in the universe, that He is present as the ground of all nature and of all history, in some sense, but that he never "breaks through," so to speak. If that were true we could never be quite certain that God exists, and still less could we be certain that God is personal. Miracles make us certain of the living God, and in the light of that certainty we can interpret the rest of our experience. Miracles mean that God has freedom and initiative to act or refrain from acting. In other words, they mean that God is personal.

This will seem, to many, all very unscientific. There is a widespread notion that any belief in miracles is ruled out by the scientific principle of the uniformity of Nature. This principle seems to me, however, to justify the very belief in the miraculous which it is supposed to discredit. It is not easy to define the uniformity of Nature in a way that will meet modern philosophical criticism; but what it means, in plain speech, is that the burnt child does right to dread the fire. The uniformity of Nature means that similar causes produce similar effects, and that the same cause, if there were any meaning in such a conception, would, if it were repeated, produce the same effect. Does it not follow, as a necessary corollary of the same principle, that a unique cause would produce a unique effect? The "laws of Nature," in other words, describe what

usually happens; assuming that there is a God, and that His will created and sustains the universe, they describe the way in which God deals with ordinary situations, fulfils ordinary needs, answers ordinary prayers. A miracle describes how God deals with the unique situation, in the life of His child or in the history of His kingdom, or answers the heroic prayer of supernatural spiritual quality. Unless a man believes that the uniformity of Nature makes it impossible for him to believe in a living God, there seems no reason why he should believe that it makes it impossible for him to believe in miracles.<sup>1</sup>

In earlier chapters of this book we have seen reason to believe in God, and to believe that non-physical entities, like the mind and will of God or of man, make an actual difference in the real world, are real causes. The miracle stories of the Bible, and especially those of the Gospels, and, where they can be substantiated by reasonable historical research, the ecclesiastical miracles, fit in with, and to that extent confirm, these results. In the long run there is no philosophical objection to miracles which is not equally an objection to a Divine revelation. And it is equally true that it is hardly more possible to believe in petitionary prayer and the answers to it than it is to believe in miracles. The whole system of Christian doctrine, creation, revelation, miracles, prayer, is woven without seam throughout. They stand or fall together. The next point to recognise is that they fit, with entire naturalness, into the religion of the Incarnation.

There is no logical reason why we should not believe that the God who created, and whose thought sustains, the inconceivably great universe which modern

<sup>1</sup> For a fuller treatment of miracle the reader may be referred to my book, *The Gospel and Modernism* (Mowbray.)

astronomy describes should not be great enough, good enough, personal enough, to go further and to care for individual members of the race which for a brief moment of time has inhabited "a third-rate planet attached to an insignificant star." It may be part of God's infinity that He cares for the almost infinitesimally small as well as for the infinitely large, for the one as well as for the whole. So the Mind which created the universe would have fellowship with the mind which has measured it, and the Love which redeemed is the Power which created. All this, indeed, is involved in our Lord's word to His disciples: "When ye pray, say our Father." For one thing that is involved in fatherhood—in contrast with sovereignty, for example—is just that a father cares for each one of his children as a separate individual.

But though it is logically possible to believe that the Creator of the universe, practically infinite in space and time, cares for individual men, listens to their prayers, and answers them, it is not easy to realise this with such a familiarity and warmth of imagination that the conviction becomes an effective motive in our lives. I suggest that the fact of the Incarnation, as it actually happened, makes such confidence possible and reasonable. If it be true that God became man and lived a human life; if it be true that Jesus Christ, loving, patient, humble, the friend of men, is the express image of God's glory, the portrait of the invisible God; if it be true that the measure of what common men are worth to God is that Christ died to save them; if this be true, then it is at least reasonable to believe in prayer, and in miracle, and in the whole system of Catholic theology which follows from faith in the Incarnation. And the belief that Jesus Christ is God rests on a man's religious and moral experience, on a rational interpretation of the

facts of the New Testament and of the results of Christianity in history, being confirmed by, and rooted in, the belief of the Christian society through nearly two thousand years.

This brings us to another point on which the men of science have expressed adverse criticisms of religion. It is often said that science rests on observation and experiment, but that religion rests on authority, on the authority of the Church or of the Bible. The Bible is discussed in the Appendix, but the authority of the Church must be dealt with here.

The point to notice is that the authority of the Church in the sphere of religion is to a large extent similar in principle to the authority of natural science. It is quite obvious that we accept on authority nearly all the scientific knowledge that we value so much. Most people believe that the sun is over 90,000,000 miles from the earth, but an insignificant percentage of those who accept it could prove the statement if they were asked. Their belief is certainly not based on observation, nor can they test it by experiment. They accept it because they were told it by a master at school, or because they have read it in a book, or because "everybody" accepts it. To take another example, there are, perhaps, five persons in every hundred million, taking the total population of the earth, who know enough mathematics to be competent to test Einstein's theories, and to compare them with their rivals and forerunners (with Newtonism, for example). But we all talk about relativity now—philosophers, and scientists, and "publicists," whatever "publicists" may be. We take it on authority.

The reason for this is, partly, that "the scientific account of the universe" is based, not only on observation, but also on difficult mathematics as well as highly skilled experimentation, and that much of this is too

difficult for most of us. The main reason why science has to be accepted on authority, however, is the specialisation which is a necessary condition of such a vast and complicated system. Even the scientists themselves have to accept much of what they hold to be true on authority. The physiologist accepts what the biochemist tells him about the composition of various bodies in human blood. He cannot test it for himself; he believes what the chemist tells him. So far has specialisation gone in these days that nobody can be a first-hand authority on the whole of even a single science, and the physicist who spends all his working hours studying the phenomena of the surface of liquids has to accept with submissive piety what another physicist tells him about the relation of electricity to magnetism.

It follows, therefore, that "the scientific account of the universe" is accepted on authority by everybody who does accept it, from Einstein or Professor Julian Huxley to the farm labourer or the child in the elementary school. It is not possible for anybody to sit in judgment on the whole of it, not even Bishop Barnes. It is almost inconceivable that any individual could understand it all, in all its details as well as in its completeness. The authority on which we accept it, therefore, is an important and undeniable fact, but its basis is vague and would be difficult to justify in any rational way.

In its own sphere, the authority of the Church is more or less similar to that of science, except, perhaps, that it is more direct and more easy to justify on rational grounds. In the sphere of religion the experience of the group is richer, and wider, and longer than that of any one of its members. Forgiveness, redemption, vocation, grace, communion with God—is there any Christian so

complacent that he can think of such words and only begin to pay attention to what others know about them, and not recognise that his own religion, and the prayers, and beliefs, and life which express it, will inevitably be one-sided, eccentric, shallow, and sterile, unless it is corrected, and deepened, and fertilised by contact with the great stream of Christian experience which is the Catholic Church? The great pioneers and discoverers in this field are the saints, whose lives of heroic charity authenticate their vision of God, and the mystics, whose experience of Divine union is its own evidence. In its own way, of course, the religion of all humble believers (their first-hand fellowship with God, the experience of His power, the doing of His will) is authoritative. They are "the babes" to whom "these things" are revealed. The ultimate authority as to what is and what is not the Christian religion is the *consensus fidelium*, the Church as the family of the saints.

All this is natural authority, and is comparable to the authority of natural science. The authority for the historical basis of the Gospel, our Lord's incarnate life and its meaning, is the testimony of the early Christians, which has been handed down to the present day, through the centuries, in the Christian society. This authority, again, is natural, but it is rather the authority which we meet in history than in science. It is evidence, testimony, tradition, and must be tested by the methods of historical criticism. The supernatural authority which the Church claims over the life, and belief, and devotion of its members, the direct authority of Christ present in the Body, the Spirit of Jesus guiding the Church into all faith, is not, I suppose, a concern of science at all.

During the nineteenth century science seemed to be brought into antagonism to religion because the wide-

spread study of biology which followed Darwin's *Origin of Species* made more people aware of the suffering and strife which are a part of Nature. The "problem of evil," for the Victorian era, meant a new sensitiveness to the suffering of living beings, and particularly of animals. Tennyson saw that—

" Nature, red in tooth and claw  
With raven, shrieked against his creed "

that God is love, and love is Creation's final law. Darwin himself was an orthodox evangelical Christian. He seems to have held that natural selection could be reconciled with theism. But he lost his own faith, apparently, as he realised the great amount of suffering that there is in Nature.

It seems quite possible that nobody could bear to know, to realise, to imagine, all the facts of the world in which he lives. The life of every living creature, animal and human, is shot through with pain. There is the worm in the beak of the thrush. The deer is paralysed with terror as the tiger tears its living flesh. The field-mouse is impaled alive on a thorn by a shrike that it may be torn to pieces with greater ease. The agony of disease among savage peoples has been described by Schweitzer with this justification—that he has given his life to alleviate this greatest terror which shadows the life of man. All men must die, but the savage dies often in indescribable pain, without drugs, without surgery, without anæsthetics. Physical pain is a sickening reality, a very frightful thing. It is the principle of evil at work in the body.

It is true that pain is Nature's danger signal; it reveals the presence of disease, and so saves life. It is true that suffering sometimes ennobles character, and disciplines and develops the soul. The greatest who have lived have been the martyrs, the heroes, the saints who have



suffered greatly. All this is true. God and god-like men can wrest good out of evil, can change base things into gold. It has been said that out of evil comes good is the fact that we call God. But evil is evil, and pain is a dreadful thing.

The thing that we have to face is that, in the account of the world which evolutionary science gives, evil is not a mere excrescence, an accident, or a waste product. It is an essential part of the system. Conflict, struggle, self-assertion, cruelty, are the very conditions of evolution. Where these things are not there is degeneration. It is a plain matter of psychological observation that disharmony between the organism and its environment is the fundamental cause of consciousness.

There are some to whom this seems to make pain and self-assertion less evil than they had seemed. If disharmony is the condition of consciousness, then it is absurd merely to call disharmony evil, as though that were all there is to be said. Is consciousness worth it? Would we, if we had the choice, prefer consciousness, with the disharmony which is the necessary condition of it, or be at peace in our environment and be an unconscious automaton? If pain, and cruelty, and conflict are the price of evolution—if evolution could not have taken place without them—then is evolution worth the price? In strict logic, of course, we cannot say until we see the final goal. But if some creatures suffer and others are cruel, and some other creatures, millions of years afterwards, enjoy the reward and reach the goal, it is difficult to resist the impression that the process is evil in itself. There is danger that men obfuscate their consciences in the effort to find *some* solution, at any cost, of the problem of evil. Cruelty and conflict are evil things, whatever may follow or come after them.

The theist has one thing to say about pain and cruelty

in the evolutionary process, and the Christian has something different to say. God, it is held, created a world in which there is development or evolution because He willed that there should be at last moral beings, who should actualise the good. Goodness cannot be created, it must be the outcome of freedom, it must be won. Evolution, then, is the necessary means to a kingdom of ends—a “Kingdom of God,” to use the common phrase—in which values are realised. It can be shown that uniformity, a world of law, is essential if freedom is to be realised. And evils are an inevitable part of a world of general law, no more to be separated from it, even by omnipotence, than the convex side of a curve is to be separated from the concave side of it. By no other path, it seems, could the goal of the great values be reached than by the path of evolution. Beauty, and truth, and goodness, and love are of great price—and they have had to be paid for by blood, and tragedy, and tears, and cruelty, and lust, and loss. It could not be otherwise.

What does the Christian say about evil? What did Jesus say and do about it? Christ’s whole attitude, in word and act, means that disease and pain are not the will of God. He strives against them as manifestations of evil. There are indications that He fights disease and pain by bearing them Himself. When a woman with an issue of blood touched Him, and was healed, He felt that strength had gone out of Him. It would be no exaggeration to apply to Him the words of the prophet: “Surely He hath borne our griefs and carried our sorrows.” It was His *sympathy*, His *love*, that was so powerful to heal. And this is confirmed by the fact that He conquered moral evil, sin, in the same way. He bore it all, accepting all they did, feeling intensely, in His whole being, the treachery of Judas, the formalism of Caiaphas, the denial of Peter, the self-seeking of Pilate.

He felt it, forgave it, loved them through it all. Love is omnipotent.

And God is what Jesus was. He endures the evil of creation. He feels every pang of pain throughout the world. Infinite Love is infinitely near to every creature. Not a little bird falls to the ground without your Father. Every sob, every cry, every pain, all sorrow, and all loss, He shares them all. In all afflictions He is afflicted. Limitless patience, enduring every pain—that is the Love of God, that is His perfection. The principle of such indomitable Love is His triumph, the Heaven where He dwells. By enduring evil He transcends it, and at last will make it good.

That is the omnipotence of God, the boundless power of infinite Love to suffer and endure. On the throne of the universe there is a Lamb as it had been slain, a Lamb slain from the foundation of the world. The Cross is the symbol of the problem of evil; the Crucifix is the Christian solution of that problem.

One essential part of the Christian Gospel, however, is the hope of immortality, and it is a hope which makes the problem of evil in the world at least more tolerable than otherwise it would be. Here, again, however, there is need of a careful understanding with science. It is assumed by naturalism (the philosophy which claims for itself the prestige of science) that the known facts of the dependence of mind upon brain make any belief in immortality unreasonable. A change in the grey matter of the brain, it is assumed, *causes* thoughts, or decisions, or emotions in the mind. When the brain is diseased or injured the mind becomes diseased, or ceases to function. As the brain grows old the mind becomes weak. A blow on the head may cause unconsciousness. When the brain dies the mind ceases. What right have we to hope for immortality?

It would be possible, perhaps, to state this apparent dependence of mind on brain even more strongly than we have done. It would certainly be easy, on the other hand, to criticise the conception in detail, as Bergson, for example, has done. It is significant that much of humanity's best intellectual work has been done by very old men, as it is significant that no neurologist, by observing a lunatic, can foretell the particular kind of degeneration of the brain which a *post mortem* examination will reveal. But the real answer to naturalism on this point is not concerned with details. All the facts on which it relies must be accepted, but they must be carefully sifted from its, often unconscious, interpretation of them. It then becomes clear, at all events when it has once been pointed out, that the facts are quite as susceptible of a Christian interpretation as they are of a materialistic one. Perhaps they mean that the brain secretes mind as the liver secretes bile. It is equally consonant with the facts to say that the mind uses the body and the brain to express itself in exactly the way in which a pianist uses a piano. There is no difficulty about this, unless we assume the materialist position at the beginning. The late Dr. J. E. McTaggart, who certainly had no prejudice in favour of orthodoxy, argued that the fact that I cannot think or have sensations without the brain and the bodily organs, while I am in the body, is no logical reason at all for believing that I cannot think or perceive external reality without the brain when the material body is dead. And there is no doubt that his position is, in strict logic, unassailable.

In the controversies of the last few years science has been drawn into a sphere in which it had never, previously, seemed to have any standing. The sacramental system of the Church, beginning with baptism, going on through confirmation, penance, holy communion, mar-

riage, holy order, and ending with extreme unction, involves the conviction that the grace of God is mediated to men through material means and visible actions. It has always been assumed that grace makes a real difference in a man's life, but it has never been held that grace can be weighed, measured, or detected by any of the instruments of the scientist. Grace is the active help and friendship of God, and I have yet to learn that friendship is one of the objects of scientific enquiry. Bishop Barnes, however, misunderstanding the Anglican doctrine of the Real Presence as well as the Roman Catholic doctrine of Transubstantiation, has declared that a postulated spiritual change in the bread and wine as a result of consecration could be disproved by experiment. And Mr. Joad, even more crudely than his episcopal hero, has disowned the "chemical theory that bread and water can change into substances of a different order by special process." The very word "substance," however, should have warned him that we are not dealing with chemistry, but with thought of a different order. The presence and activity of God, in the Sacraments as well as otherwise, are not the matter of scientific enquiry.

The world in which we live is a world of persons and things. For a few short years, in and through co-operation with our fellows and service of them, by the use we make of the external world and what is in it, we offer ourselves to the God and Father of all, and are made worthy to be offered. What the world and the things in it are, so far as they can be relied on and used for human ends, science tells us. To the extent to which this scientific knowledge makes clear the mind of the Creator, reveals His will for His children, and reminds them that credulity and superstitious fancy can be no means of fellowship with Him, it has a real place in religion. But the central affirmations and intuitions of

faith are concerned with the Father's relations with His children, with His redeeming them from sin, and the freedom in loving service in which they shall worship Him. And these realities are discerned and served in a sphere of personal relationships in which the methods and standards of science can be no more than subordinate and subsidiary. Man's chief end is to glorify God and to enjoy Him for ever. Science may give us help in doing this. God made me, and all the world. Science may tell us a little of how He did it.

## BOOKS TO READ

*Christus Veritas*, W. Temple. (Macmillan.)

*Essays and Addresses in the Philosophy of Religion*, F. von Hügel.  
(Dent.)

*Essays Catholic and Critical*. (S.P.C.K.)

*Faith and Truth*, Brabant and Hartill. (S.P.C.K.)

## APPENDIX

### SCIENCE AND THE BIBLE

THE Bible is a collection of writings, the earliest of which dates, perhaps, from about 900 B.C. and the latest from about A.D. 100. These writings are of all kinds—histories, law-books, biographies of great teachers (in particular, of course, of Jesus Christ), dramas, love songs, collections of proverbs, the hymn-book of the Jewish Church, letters, theological treatises, historical fiction, political tracts, and various combinations of these. It should be noted, however, in particular with regard to the history and the biography, that the authors made no pretence, in their writings, to be free from the desire to edify. It is also obvious to anybody who reads the Books of the Bible in the light of contemporary writings and of the most reliable modern research that they do not possess any supernatural infallibility as records of the history of nations or the lives of individuals, and that they are no more free from scientific errors than other books of the same period.

For example, it is plain that the account of the creation of the world and man, in the first chapter of Genesis (which dates, perhaps, from the fifth century B.C.), cannot be reconciled, by any ingenuity of interpretation, with the account of the universe given by science since Copernicus, Galileo, Newton, Darwin, and Einstein, and neither of these accounts can be reconciled with that in the second chapter of Genesis, which was perhaps written down in the ninth century B.C. It is unlikely that Joshua had a miraculous presentiment of the Copernican astronomy, although it is far from certain

that when he told the sun and moon to stand still he really expected them to do so, or that the Biblical author thought they had done so. Perhaps it was the less prosaic appeal to all the works of God to watch him give the Lord's enemies what they deserved!

“Something is stronger than strength and slays it,  
Now we have written for all time later,  
Five Kings are great, yet a law is greater.  
Stare, O sun, in thine own great glory,  
This is the turn of the whole world's story.  
Stand thou still, thou sun, upon Gibeon,  
Stand thou, moon, in the valley of Ajalon!”

The Books of Samuel, the Kings, and Chronicles are not always easy to reconcile with each other or with the more or less contemporary records of other kings and peoples. They are quite good examples, however, of history written with a purpose, as that craft was understood five or six hundred years before Christ.

So it is with the New Testament. The writers shared the beliefs of their contemporaries about such things as medicine and disease, demon possession, and the physical universe as a whole, although there is little here of any contact with the magic or astrology which did so much to spoil the later stoicism. They believed what others believed about the history of the Hebrew people, the history of Hebrew religion, and the authorship of the Books of the Old Testament. There is no evidence that our Lord had read any book but the Old Testament, or that He did not, in His Incarnate life, share the mind of His age on such matters as history and science.

All this (it still needs to be said) has nothing to do with the inspiration of the Bible, with its value for Christians in particular or humanity in general, or with its being, or rather containing, the Word of God. People really must face the difference between infalli-



bility and inspiration. The two conceptions have, indeed, little to do with each other, as the literature of information has little to do with that of power. Nobody complains of the *Encyclopædia Britannica*, or a handbook of mineralogy, that it is not inspiring, but, within its limits, we expect it to approximate to infallibility. On the other hand, nobody complains of Shelley's "Ode to the West Wind" that it was written in terms of a meteorology which had not learned how to estimate the effects of anti-cyclones over the West of Ireland, or of Shakespeare's *Macbeth* that it takes liberties with history; we go to them to be uplifted, ennobled, disciplined—let us welcome the word—inspired. The value of moral and spiritual teaching, whether the teacher belongs to our own or to some other age, has very little connection with the kind of astronomy, or geology, or biology, in "terms of which" the teaching is expressed. Dante's *Divine Comedy*, or Plato's *Republic*, has eternal value for the spirit of man; it has not really been put on the scrap-heap by Darwin's *Origin of Species*. Nobody really believes that the Book of Job or the parable of the Prodigal Son has no spiritual value for the twentieth century because modern mathematicians have invented descriptions of the universe and the atom which most of us cannot understand! If this is so, however, then the talk of the modernists and rationalists about the relation of the Bible to modern science is so fundamentally irrelevant as to be dishonest.

The Bible consists of the Old Testament and the New Testament. The value of the Old Testament is, in general, twofold. First, it may have direct moral and religious value for everybody who reads it intelligently. The Hebrew prophets are a succession of spiritual teachers of unrivalled significance in human history.

With a corporate certainty and consistency that can rightly be called miraculous, they lifted religion on to an ethical and rational level, and kept it there. They still have lessons which all men need to learn, though some may be too complacent to read them. The dim, gigantic figure of Moses, the dramatic career of Isaiah of Jerusalem, the heroic suffering of Jeremiah, the moral elevation of Amos or Micah—these are possessions for ever for the race of men. Into the words of the Psalms the spiritual experiences of twenty-five centuries have been poured. And under the Ten Words from Sinai, during all the centuries, as culture and civilisation advance, as the spirit of man becomes broader, deeper, more rich, as duty becomes more complicated, difficult to know, costly to perform, at every level it is possible to subsume the whole duty of man under these ten words, as the great Catholic moralists have done, from St. Augustine to Bishop Gore. See what that means. When you find words that are not left behind as man climbs towards God, which are fitted always to carry richer, fuller meaning—to express new, higher, more spiritual ideals—well, that is what we mean when we say that the words are inspired. We mean that the words come out of the heart of humanity; they have come out of the mouth of God.

The second value of the Old Testament is that it is, rightly read, the most fascinating story of progress in all literature; progress in culture, in morality, in religion; a "spiritual" evolution in the richest meaning of the phrase. It begins with the naïve, almost childish story of how God moulded clay and made a man, and breathed into him, and he lived and became a companion with whom his Maker walked and talked in the evening coolness. It reaches its climax in the wonderful insight and spirituality of the Servant Songs in the

second part of Isaiah. It was an evolution which held together, at every stage, the ceremonial and the ethical, the social and the personal, the external and the spiritual. The Old Testament shows at each level a strange, dramatic marriage between the direct experience of God, the individual fellowship and obedience, which is the beginning and end of religion, and the tradition, authority, public worship, and ecclesiastical machinery, without which religion cannot survive, still less propagate itself.

This development leads up to, and culminates in, the life of Jesus Christ. It provided the forms of thought and language in which He expressed His teaching, and in which primitive Christianity interpreted Him and His work for mankind. It is, indeed, of vital importance for the understanding of Christianity. Ritschl, a theologian and critic of quite unusual insight, has said that the permanent significance of the Canon of the New Testament is to be found in the fact that its writers understand Jesus against the background of the Old Testament. That is a valuable idea, if only because it reminds us that the full meaning of the Incarnation implies its place in history.

The New Testament is the Book of the Incarnation, which was, and always will be, the *differentia* of Catholic Christianity. It contains two things—the story of the life of Jesus and the account of its immediate results. These include the impression that He made on those who knew Him, the beginnings of the Christian Church, and the revelation of God's saving power which came into men's minds and lives through Him. There is here a redeeming experience of God in Christ, an experience which is classical and normative because it began in unmediated relationship with Incarnate God. The authority of the New Testament is

that it contains the classical statement of the Christian experience of salvation through Christ.

In all this account of the value of Holy Scripture, and of the "content" of the idea of inspiration, there has been said nothing which has any connection at all with infallible accuracy about science and history. The reality, the holiness, the tremendous majesty of God, can be taught at least as completely through poetry as through fact, through drama as through history, through fiction as through science. And this view of the Bible has not been adopted by the Church through the pressure of modern scientists. In the first Prayer-Book of King Edward VI. (1549), in the service for the Ordering of Priests, the Bishop is instructed to ask the ordinand: "Be you persuaded that the Holy Scriptures contain sufficiently all doctrine required of necessity for eternal salvation, through faith in Jesus Christ?" There is no word about infallibility, and this is confirmed by the Thirty-Nine Articles. Popular anti-Christian writers, then, must give up their uneducated habit of identifying anything they can find in the Bible with the teaching of the Church, and must go to the Church and not to the Bible, or to individual theologians, to find out what Christianity teaches. It is true that the Reformed Churches which have the Westminster Confession as one of their standards seem to be committed to a belief in the infallibility of Holy Scripture, but that is their misfortune, and opponents of Christianity must make what capital out of it they care to make.

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Christianity & science in  
the 20<sup>th</sup> century.

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